

Intergovernmental Oceanographic Commission



EXPERT MISSIONS TO INDIAN OCEAN COUNTRIES TO ASSESS REQUIREMENTS AND CAPACITY FOR AN EFFECTIVE AND DURABLE NATIONAL TSUNAMI WARNING AND MITIGATION SYSTEM

Indonesia

Jakarta, 29 August – 2 September 2005

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NATIONAL TSUNAMI WARNING AND
MITIGATION SYSTEM**

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Paris, 29 November 2005
English only¹

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PHOTOGRAPHS



The meeting room at BMG



Jan Sopaweluhakan, Mrs Sri Woro Harijono,
Mr Prih Harjadi, Mr Idwan Suhardi



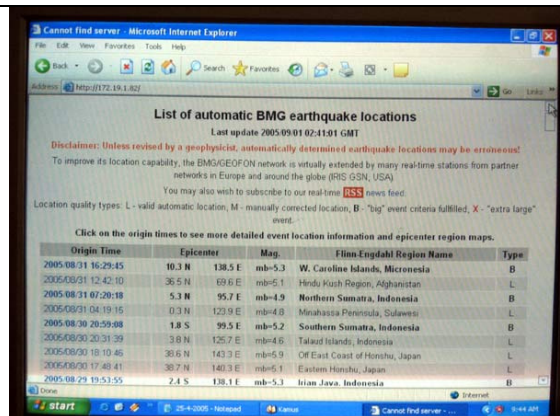
Digitizing an analog sea level recording at
BAKOSURTANAL



The earthquake information room at BMG



The ASEAN earthquake information centre at
BMG



The online list of automatic BMG earthquake
location



Local officials addressing the audience during the Padang simulation exercise



Padang Red Cross volunteers pitching a field operations tent during the Padang simulation exercise



SATKORLAK and Red Cross volunteers attending to the “wounded” on the beach during the Padang simulation exercise



SATKORLAK and Red Cross volunteers attending to the “wounded” in town during the Padang simulation exercise

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ANNEX II:	COUNTRY ASSESSMENT QUESTIONNAIRE ON TSUNAMI WARNING AND MITIGATION ACTIVITIES

MISSION SUMMARY SHEET

VISIT DATE: 29 August – 2 September 2005

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- Dr. Laura Kong (IOC/ITIC, Honolulu, USA)
- Mr David McKinnie (NOAA International Tsunami Program, USA)
- Dr Walter Mooney (USGS, USA)
- Mr Praveen Pardeshi (UN/ISDR, Geneva, Switzerland)
- Mr Peter Pissierssens (UNESCO/IOC, Paris, France – Team Leader)
- Mr Grahame Reader (BOM, Australia)
- Mr Brian S. Yanagi, Deputy Director, ITIC (NDMO expert)

(Full addresses are given in [Annex 1](#))

NATIONAL EXPERTS AND AGENCIES PARTICIPATING:

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- Parluhutan Manurung, BAKOSURTANAL
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- Klaus Michael Rottman, Germany Embassy

(Full addresses are given in [Annex 1](#))

AGENDA:

29 August 2005

Meeting at BMG

- Presentations by visiting experts
- Presentations by national experts
- Questionnaire discussions

30 August 2005

Meeting at Bakosurtanal

- Presentations by Dr Laura Kong and Dr David McKinnie
- Presentation by Chairman of Bakosurtanal
- Visit to Bakosurtanal facilities
 - Sea level laboratory
 - Geodynamic laboratory
 - Marine mapping laboratory
 - Land mapping laboratory

31 August 2005

- **Visit to Padang**, West Sumatra to attend disaster response simulation exercise

1 September 2005

- **Visit to BMG facilities**
- Discussion of recommendations

1. OPENING OF THE MEETING

The Session was opened by Sri Woro B. Harijono, BMG Director-General.

2. OBJECTIVES OF THE MISSION

The purpose of each national assessment mission will be:

- i. to inform national stakeholders on the requirements (organizational, infrastructural and human resources) for the establishment and operation of a tsunami warning and mitigation system;
- ii. to assess the available resources (organization, infrastructural and human resources);
- iii. to identify capacity building needs .

3. PRESENTATIONS BY VISITING EXPERTS

3.1. MISSION TEAM LEADER

By Mr Peter Pissierssens, IOC Mission Team Leader

In his introduction Mr Peter Pissierssens recalled that the objectives of the Indian Ocean Tsunami Warning and Mitigation System (IOTWS) will be (i) to assess national tsunami risk; (ii) to establish national and regional warning systems against local, regional and ocean-wide tsunamis; and (iii) to promote preparedness and risk reduction against tsunami hazard.

He then informed the meeting that IOC, in collaboration with ISDR had obtained US\$ 3.5 million within the framework of the first UN/OCHA Flash Appeal. These funds were intended to enable (i) organization of two international coordination meetings; (ii) organization of national coordination meetings and expert advisory missions; (iii) preparation and distribution of pamphlets to promote awareness and preparedness at the regional level; (iv) support for national awareness and preparedness activities; (v) establishment of operational sea-level gauges network; (vi) provision of interim tsunami bulletin service; (vii) organization of training courses; and (ix) deployment of DART buoys. He also explained that a second proposal had been submitted, for US\$ 11 million, that would expand and further develop the actions accomplished under the first project.

Mr Pissierssens then described the accomplishments of the two international coordination meetings that had taken place in Paris, France between 3-8 March 2005, and in Grand Baie, Mauritius between 14-16 April 2005 respectively and that had contributed to development of a governance system for the IOTWS.

The Paris meeting had resulted in a Communiqué. Mr Pissierssens summarized the highlights as follows: (i) the System will be built and established through international cooperation under a UN umbrella; IOC will provide the international coordination mechanism and will work in close partnership with other (specialized) agencies; (ii) the System shall be owned and managed by the Member States of the Indian Ocean region, and will be built on national capabilities and centres; (iii) the System will “plug-in” into existing natural disaster management systems. The Paris Communiqué further called for the establishment of an Intergovernmental Coordination Group (ICG/IOTWS) with IOC as the Secretariat. The Communiqué further stressed that the system should be a coordinated network of national systems and that data sharing would be crucial for the operation of the System. It was further agreed that PWTWC and JMA would provide an interim tsunami advisory information service.

The Mauritius Meeting had re-affirmed the commitment of the countries of the region and informed the countries of the work plan as detailed in the first UN/OCHA project document.

The Meeting had further invited countries to assess their requirements and capacity building needs by July 2005, to be followed by the drafting of national strategic plans. During the Mauritius meeting, several donors had pledged support (Finland, Belgium, Norway, Germany, Italy) for the development of the IOTWS.

Mr Pissierssens then recalled the objectives of the mission, as described in 2 above. He noted that so far 16 countries had requested an assessment mission and that 2 teams would visit these during the period June-August 2005. Each mission would be preceded by a pre-mission information gathering (online and paper questionnaires). Each mission would have a duration on approximately 3 working days and would be composed of 4-5 members. The teams would include IOC, WMO, and ISDR experts and possibly also an expert from an operational tsunami warning centre (Japan or USA). Each mission team would prepare a report.

The national reports would enable countries to more clearly identify their capacity building needs that could be addressed from national resources or could lead to project proposals for submission to donors. Mr Pissierssens explained that further assistance could be provided, in cooperation with relevant agencies, to develop such proposals, as needed.

It was expected that the consolidated report for all missions would provide a detailed overview of existing and required capacity for the entire region that would enable the partner organizations and participating countries to effectively plan and implement the regional elements of capacity building activities such as training courses, public awareness materials etc.

3.2. DISASTER MANAGEMENT EXPERT (BY ISDR)

By Mr. Praveen Pardeshi

In his presentation Mr. Pardeshi covered:

- ☐ Mandate and role of ISDR
- ☐ Platform for Promotion of Early Warning and International Early Warning Programme
- ☐ Tsunami early warning systems in Indian Ocean
- ☐ ISDR's check points during the assessment mission

The ISDR is a global strategy that encourages and facilitates concerted action to reduce risk and vulnerability to natural and related technological and environmental hazards. It involves all stakeholders and facilitates dialogue and concerted actions. ISDR was established in the year 2000 by the UN General Assembly as a replacement for the IDNDR .

Praveen Pardeshi then explained that ISDR coordinates and facilitates disaster reduction in through the following focus areas:

- (i) provide support to policy and strategy development through national platforms and authorities:
- (ii) information sharing and knowledge exchange
- (iii) public awareness and advocacy: this targets higher government officials (politicians).
- (iv) networking and partnerships for integration of disaster reduction in planning.

In terms of the Indian Ocean Tsunami, Praveen Pardeshi explained that during the World Conference on Disaster Reduction (WCDR), UN/ISDR, together with other UN organizations launched the International Early Warning Programme – IEWP at the WCDR in Kobe, Hyogo, Japan on 19 January 2005.

Early warning systems are built on four elements:

1. Risk Knowledge – focusing on prior knowledge of the risks faced by communities;
2. Warning services – emphasizing technical monitoring and warning services ;
3. Dissemination – emphasizing dissemination of understandable warnings to those at risk;
4. Response capability – focusing on knowledge and preparedness to act by those at risk.

However during the Indian Ocean tsunami it was realized that all four elements failed. Though Indonesia was a part of the Pacific Tsunami Early Warning network and had many tidal gauges and seismic monitors in the region. However no lives could be saved because warnings were not disseminated to people at risk. Moreover the people at risk were not aware of Tsunami risk nor did they have any preparedness in how to respond, and evacuate to safety.

In Semilieu island people preserved ancestral knowledge of previous tsunami in 1907 and developed system of community warning and evacuation to higher ground based on interpreting earthquakes associated with sea level drop. In this way they could save many lives. These traditional knowledge based community level preparedness and early warning systems need to be replicated along the coast of Sumatra .

Praveen Pardeshi informed the meeting that UN/ISDR – Platform for the promotion of early warning (PPEW), joined the UN flash appeal for *evaluation and strengthening of early warning systems in countries affected by Tsunami last December*. UN/ISDR – PPEW received a total of 11 million (pledge and money received) in response.

The project has five components, including 1) core system implementation, 2) integrated risk knowledge, 3) public awareness and education, 4) community level approaches and 5) project coordination. The project is being undertaken primarily through partnerships among UN (e.g. IOC) and other organizations.

The ISDR's entry point to the National Needs Assessment includes assessing how Tsunami Early Warning System development is integrated into countries' other disaster risk management and reduction efforts . In this context ISDR will seek to identify linkages between the National Disaster management authority and the tsunami warning authority. It will seek to assess how the NDMO, (BAKORNAS in Indonesia's case) co-ordinates with other sectors of the Government for preparedness. It will also assess the linkages between local Government at SATLAK level and community roles in response to warning .ISDR will also co-ordinate between National Tsunami warning center. It will also assess the state of preparedness, and responsibilities for co-ordination.

3.3. METEOROLOGY TECHNICAL EXPERT (IDENTIFIED BY WMO)

By Mr Grahame Reader

Mr. Reader explained that the World Meteorological Organisation has two main goals in relation to the Indian Ocean Tsunami Early Warning System.

The first goal, which is addressed in this mission, is to enhance national alert and response mechanisms of each country. This can be achieved by first assessing the requirements and capabilities of each National Meteorological and Hydrological Service (NMHSs) and then assisting them to:

- (a) Enhance their capacity for clear communication and timely dissemination of effective tsunami early warnings within a multi-hazard framework. This involves building on the current capabilities for issuing warnings into useful and reliable information for the authorities and the public (for both public and marine safety);

- (b) Enhance public awareness of risk (for multiple hazards) through Education and Public Outreach Programmes for decision makers and other stakeholders.
- (c) Develop training modules, tailored to their specific community and cultural needs, to improve communication between NMHS, emergency managers and other decision makers.

The second goal is to upgrade the WMO Global Telecommunication System, to address information exchange needs for tsunami related data and warnings. This expert mission will be conducted separately, due to the technical nature of the requirements. The mission will focus on a technical assessment of current national GTS components, identifying highest priority upgrades and consolidation of EWS related data exchange requirements. The mission will consist of an expert from the regional telecommunication Hub (RTH) and an expert taking account of current technical cooperation links between NMSs

3.4. TSUNAMI TECHNICAL EXPERTS

3.4.1. Dr Laura Kong: Introduction

Dr. Kong provided a comprehensive overview of the important components of an effective tsunami warning and mitigation programme using examples and experiences from the IOC's 40-year experience in the Pacific. Tsunamis, which can occur at any time and cannot be predicted, are a global, high-fatality, low-frequency hazard that can strike in minutes, and cause damage for hours and over an entire ocean basin. An effective tsunami early warning system is achieved when all persons in vulnerable coastal communities are prepared and respond appropriately, and in a timely manner, upon recognition that a potentially destructive tsunami is coming. For regional and distant events, timely tsunami warnings issued by an officially-recognized tsunami warning center are essential. When these warning messages are received by the officially-designated government agency, national tsunami emergency response and preparedness components must already be in place so that well-known and practiced actions are immediately taken to evaluate the scientifically-based warning, and communicate an appropriate course of action to ordinary citizens. Tsunami preparedness programmes must already have started so that good decisions can be made without delay.

Although a tsunami cannot be prevented, its impact can be mitigated through community and emergency preparedness, timely warnings, effective response, and public education. An effective warning system will be achieved when the following activities are undertaken:

- (a) Identification of the tsunami hazard, assessment of risk, and mitigation to reduce wave impact. Tsunami evacuation maps which show where flooding is likely are based on this information
- (b) Issuance of timely warnings. For a distinct tsunami, real-time earthquake and sea level monitoring to confirm the generation of a destructive tsunami, followed by immediate dissemination to the public, is critical. For a local tsunami where there may not be time for an official warning, people must already know a tsunami's natural warning signals (earthquake, sea receding...) and respond immediately.
- (c) Continuous and sustained awareness activities to sustain preparedness. Education is fundamental to building an informed citizenry and to ensure that the next generation of people are equally prepared. Political support, laws and regulations, and institutional responsibility are key contributions.

In order to achieve an effective system, the activities must be conducted at the same time and actively engage and inform in an understandable manner all stakeholders from the highest government officials to households and disadvantaged and transient populations. Coordination and open

information sharing are essential, and an effective mechanism such as a national tsunami warning coordination or review committee to oversee all activities should be established.

Sibolga, Indonesia, is located in the tsunami source region of the 26 December 2004 and 28 March 2005 earthquakes. Until more stations are installed over the next six months, it will be difficult to impossible for the warning centers to provide meaningful evaluation of the destructive potential of a tsunami to countries which border the Bay of Bengal. Should a ocean-wide tsunami be generated, Dr. Kong stated that countries in the western Indian Ocean and Arabian Sea should have an indication of the destructive nature of the tsunami from sea level readings from Sibolga, Indonesia, Colombo, Sri Lanka, and Male, Maldives

3.4.2. Dr. Walter Mooney: seismological observations

Dr. Walter D. Mooney of the U.S. Geological Survey provided an overview of the seismological observations regarding tsunamis and earthquakes, with a particular reference to the Great Sumatran-Andaman Islands earthquake. On Dec. 26, 2004, the world experienced one of the worst natural disaster of the past 100 years when this magnitude 9.3 earthquake generated a tsunami that devastated many coastal regions of the Indian Ocean. There was a tremendous outpouring of humanitarian assistance from numerous nations around the world in response to this highly unexpected event. The tragedy sparked wide-spread heightened interest in tsunamis and earthquakes, not only among the public and media (T.V. and press) but also in the scientific community. Important questions were raised as to how such a disaster could have happened without short-term warning, or even a long-term forecast of tsunami risk. Many of the questions also reflected a general fear in the world's coastal and earthquake prone regions as to whether it was possible for a similar event to happen at home. For example seismologists were frequently asked questions from the press and public at large whether other portions of the SE Asian region could ever be hit by a large tsunami. It soon became apparent to us that many people, including those of the press and T.V. media, had forgotten the history of some past natural disasters. For example, very few people have never heard of the M=9 earthquake in 1700 in western North America that caused a tremendous tsunami that crossed the Pacific Ocean to devastate Japan.

Dr. Mooney described many seismological observations for the 2004 Great Sumatra-Andaman Islands earthquake. Using computer simulation models, he demonstrated several important concepts, including: (1) how seismic waves travel through the Earth; (2) the time duration of the earthquake rupture (500 seconds) and how long was the fault (1,300 km); and (3) how this earthquake generated a large tsunami that moved at about 600 km/hr across the Indian Ocean basin. All of these educational materials were provided to the host for their use.

He concluded by describing recent technical developments in the Indian Ocean region that will improve the monitoring of potential tsunami-generating earthquakes. This includes the staffing of some national centres in the United States (Pacific Tsunami Warning Center, PTWC, and USGS-National Earthquake Information Center, NEIC) on a 24 hour/7 days a week basis. Additional improvement in earthquake monitoring and tsunami warning can be expected as the national of the Indian Ocean region build their infrastructure and human capacity.

3.4.3. Dr. David McKinnie: Tsunami Warning System Elements

In his presentation Dr McKinnie explained that one can think of three levels of tsunami warning systems that range from most basic to most complex. The first level includes earthquake detection systems, a way to disseminate warnings and advisories, and an educated public able to take the right actions. The second adds the ability to detect tsunami. And the third includes the ability to forecast tsunami along with the other elements. While the most complete system may be desirable, it is not always possible to achieve it given limitations of data and cost; progress in any of the key elements of tsunami warning systems is important and will help save lives.

Tsunami detection and forecast systems are the focus of this presentation. Compared to earthquake detection, tsunami detection is still in its infancy. There is a robust network of seismometers that allows seismologists to evaluate and locate events within minutes. For tsunami, there are just a few DART buoys operating in the Pacific Ocean—though more are planned for deployment over the next two years—and tide gauges, while important for tsunami detection, are often located in areas (ports, harbors) that mask tsunami signals.

Deep ocean Assessment and Reporting of Tsunami (DART) technology was developed originally to reduce false alarms. It works by sensing bottom pressure in deep water (up to 6,000 meters) and by reporting variations in pressure as a tsunami passes over. It is very accurate and can measure differences in water column height of less than 0.2 centimetres in 6,000 meters of water. US DART data report in real time; data are available to all via the Internet.

DART data, however, are difficult to interpret without a deep-ocean propagation model (at least) and preferably, local inundation models. To be most useful for modelling, DART (and similar) technologies must be accurate to .5 cm; sample at a rate of 1 minute or less, process measurements within two minutes, and report data within five minutes,

For the Indian Ocean, DARTs should be located to provide the maximum warning lead time for the greatest number of populated areas. Initial calculations show that on the order of 25 properly sited buoys could provide up to 90 minutes of warning time for much of the Indian Ocean region.

Examples from the US (Hilo, Hawaii, and Crescent City, California) show that DART data, interpreted through models, can give very good results. Modelling for the Indian Ocean region is critical; Indonesian scientists and modellers can work with counterparts through the IOC to develop regional and local models.

Finally, the Perth ICG meeting in early August established working groups that give Indian Ocean nations (and donors) a framework for contributing toward development of an Indian Ocean Tsunami Warning System. Indonesia and the rest of the Indian Ocean nations can take advantage of this framework in seismic networks, tide stations, DART technology, modelling, risk and vulnerability assessment, and regional center interoperability to share information and data and to collaborate in developing a truly regional—and robust—tsunami/all hazards warning system.

3.5. DISASTER MANAGEMENT EXPERTS

3.5.1. M. Arakida:

Mr. Arakida provided a comprehensive overview of the tsunami disaster management system in Japan as a good practice for establishment of tsunami early warning system. Japan has been suffered from Tsunami disasters and such experiences made the present Japanese Tsunami countermeasures; structural countermeasures such as construction of sea walls, and Tsunami early warning system. In Japan, there is a basic law on disaster management named Disaster Management Basic Act, which is the Basis for disaster management in Japan. The main contents of are;

- (a) Definition of jurisdictions and responsibilities for disaster management
- (b) Disaster management system
- (c) Disaster management plan
- (d) Disaster preparedness
- (e) Disaster emergency response
- (f) Disaster recovery
- (g) Financial measures

The Central Disaster Prevention Council chaired by the Prime Minister is also defined in it. The other members of the Council consist of:

- (a) Minister of State for Disaster Management and all Cabinet Ministers
- (b) Chief of Designated Public Corporations such as the Governor of the Bank of Japan, -President of Japan Red Cross Society, President of NHK (Japan Broadcasting Corporation), President of Nippon Telegraph and Telephone Corporation
- (c) People of experience or academic standing,

and its role is to;

- (a) Prepare and promote implementation of the Basic Disaster Management Plan and draft the Earthquake Disaster Management Plan
- (b) Prepare and promote implementation of the urgent measures plan for major disasters
- (c) Deliberate important matters pertinent to disaster management according to requests from the Prime Minister and/or Minister of State for Disaster Management (general coordination of basic disaster management policies and disaster management measures, declare emergency situations caused by disasters etc.)
- (d) Offer opinions regarding important matters pertinent to disaster management to the Prime Minister and Minister of State for Disaster Management.

Mr. Arakida then referred to the elements of Tsunami Early Warning System, which are the tsunami observation, information transmission, and preparedness in the community.

As tsunami may arrive within 10 minutes in some areas in Japan, it is critical to rapidly make early warning to the residents. A tsunami warning is transmitted from the Japan Meteorological Agency (JMA) and the Fire and Disaster Management Agency (FDMA) to local governments by using the disaster management radio. The tsunami warning is transmitted by the disaster management radio to residents using an outdoor speaker and/or electronic signboards. Moreover, the warning appears on televisions and radios.

Regarding Preparedness in the community level, he explained the importance of making evacuation plan for each community. In Japan, the Disaster Management Basic Act regulated that local municipalities are responsible for protecting people and property against disaster. Therefore FDMA requires local municipalities to make evacuation map and evacuation plan. In the evacuation map, the area that is flooded when Tsunami occurs would be described, and based on the evacuation map, evacuation plan would be made. In Japan, to establish a tsunami evacuation plan at regional workshops is promoted since it instills a basic idea that the residents themselves can protect their own lives. If the residents are actively involved in preparing an evacuation plan, they can better relate to the plan that they have well prepared. This involvement helps to raise the awareness of the importance of disaster prevention and ensures that the plan reflects the local characteristics better. As these residents are familiar with their own evacuation plan, they can be expected to evacuate to safer places faster and more efficiently. After making evacuation plans, it is recommended to conduct drills to confirm the place and route for evacuation.

3.5.2. Mr. Brian Yanagi

The Pacific Tsunami Warning Center (PTWC) and the Hawaii Civil Defense System is an example of an “End-To-End” Tsunami Warning and Mitigation System. An end to end system refers to the ability of the Tsunami Warning System to detect and disseminate tsunami information to the emergency management community and to the public for coastal evacuation as ordered by Civil Defense officials.

State and County Civil Defense are Disaster Management Offices and by law, have the responsibility to prepare for and respond to natural and man-made technological emergencies and disasters. The objective of Civil Defense is to save lives and reduce property losses with immunity from liability law protection.

When PTWC issues Tsunami Advisory/Watch/Warning Bulletins, the Hawaii State Civil Defense (HSCD) System activates its respective State and County Emergency Operating Centers (EOC's). HSCD interprets local and distant tsunami PTWC Bulletins and orders designated coastal public evacuation actions.

Tsunami Information Bulletin: Strong earthquake has occurred in the Pacific Rim, but does not pose a Pacific wide distant tsunami threat. ACTION: None.

Tsunami Advisory Bulletin: Strong earthquake has occurred in the Pacific Rim, and it is not known if a destructive Pacific wide tsunami has been generated. PTWC is evaluating the situation. ACTION: Activate the EOC and monitor event for possible upgrade to a Watch status or Cancellation of Advisory Bulletin.

Tsunami Watch Bulletin: A major earthquake has occurred in the Pacific Rim and it is unknown if a destructive Pacific wide tsunami has been generated. PTWC is evaluating the situation. Estimated wave arrival time to Hawaii is between 3 – 6 hours. The Watch may be upgraded to a Warning status or cancelled. ACTION: Activate the EOC and PREPARE TO EVACUATE THE COASTLINES. Initiate Tsunami Watch contact notifications and action checklist procedures.

Tsunami Warning Bulletin: A major earthquake has occurred in the Pacific Rim and a destructive Pacific wide tsunami has been detected or is likely to have been generated. Estimated wave arrival to Hawaii is less than 3 hours. ACTION: Activate the EOC and START EVACUATION OF THE COASTLINES. Initiate Tsunami Warning contact notifications and checklist procedures.

Urgent (Local) Tsunami Warning Bulletin: A major earthquake has occurred within the Hawaiian Island Chain and a local destructive tsunami may have been generated. ACTION: Activate the EOC and EVACUATE THE COASTLINES IMMEDIATELY. Initiate Urgent Tsunami Warning contact notifications and checklist procedures.

Tsunami Cancellation Bulletin: There is no threat of destructive tsunami waves or destructive tsunami wave action has ceased.

PTWC Tsunami Bulletins are transmitted to HSCD personnel via multiple and redundant means. These include land line telephone, text messages on cell phone and pagers, a dedicated inter-island data net, a Pacific Disaster Center web site message log, a dedicated Hawaii Warning System (HAWAS) voice public address system at 24/7 Police Dispatch Centers and EOC's, and if needed, satellite communications.

The worldwide media instantaneously receives PTWC Tsunami Bulletins through NOAA weather wire and quickly broadcast information to the public. This initiates numerous phone call inquiries from the media and public. HSCD begins to issue public preparedness press releases.

During a Tsunami Watch, HSCD conducts a 15 line telephone conference call with PTWC and primary emergency response organizations to coordinate actions. HSCD's volunteer Tsunami Scientific Advisors supplement PTWC's analysis as to whether or not a destructive tsunami was generated by the earthquake.

HSCD needs at least 3 hours to execute the evacuation of over 300,000 residents and tourists from the coastlines. HSCD utilizes its GIS capabilities to determine critical facilities, schools, and infrastructure at risk in tsunami evacuation zones.

Once PTWC issues a Tsunami Warning Bulletin, HSCD sounds over 300 sirens statewide and engages the Emergency Alert System (EAS) on radio and television. The purpose of sirens is to get the public's attention to turn on radio and television to hear any EAS system announcement. If a Tsunami Warning has been issued, the location and magnitude of the earthquake, and expected wave arrival time to Hawaii are disseminated. The public is instructed to begin evacuation of the coastlines to about a ½ mile inland. Also, the public is told to refer to Tsunami Evacuation Maps and Civil Defense instructions printed in the front of the phone book, and cautioned to avoid inland waterways connected to the ocean due to strong wave activity. Those people that are inland and safe are instructed to stay where they are, and not to get into a vehicle, which can cause traffic jams. Moreover, public schools in tsunami evacuation zones would walk their students inland to safety. Additionally, mariners are advised that vessels are safer in deep water, at least 200 fathoms. On Oahu, public shelter locations are annotated in the Tsunami Evacuation Maps. Sirens are subsequently sounded two hours, one hour and 30 minutes prior to first wave arrival time. The public is advised not to return to the coastlines until Civil Defense issues an "all clear" broadcast.

Civil Air Patrol Cessna type aircraft, equipped with loudspeakers, fly around the coastlines and areas with poor siren coverage to alert the public to evacuate. Police and life guards engage their vehicle sirens and loud speakers along the beach.

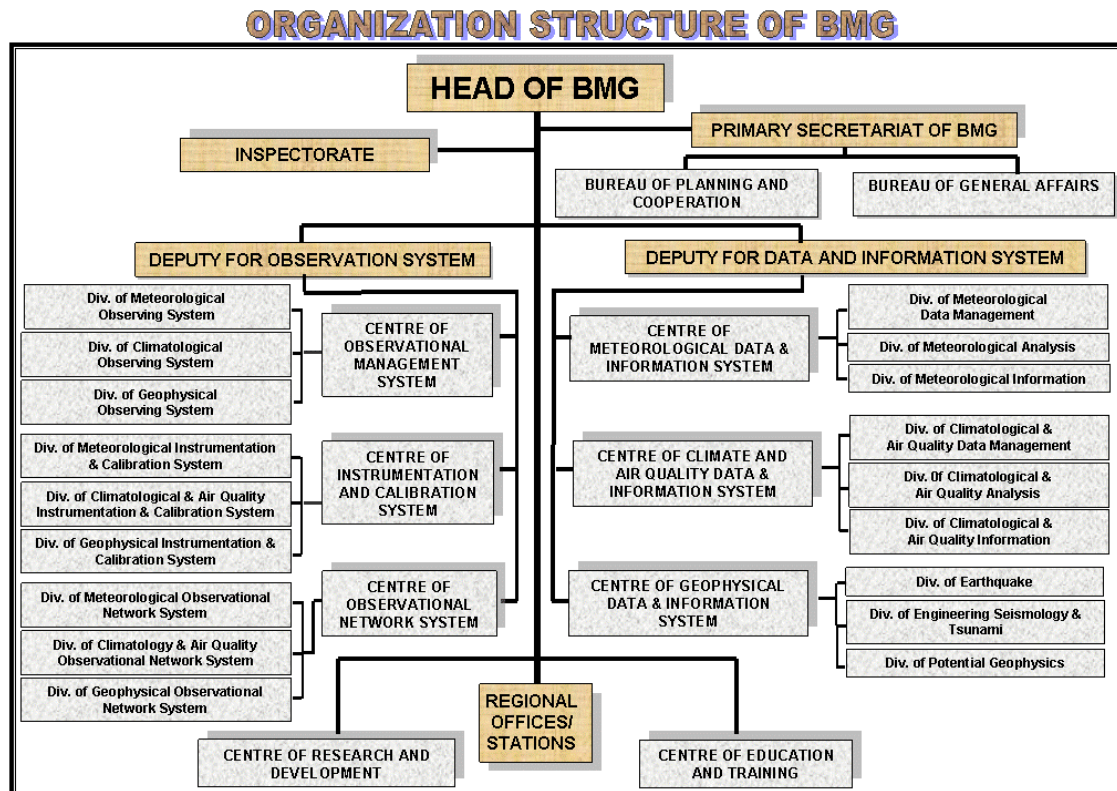
Government and Non-Government Organizations begin to execute their respective Tsunami Emergency Response Plans. For example, roadblocks are set up by police and public works officials to prevent vehicles from entering the tsunami evacuation zones. City buses shuttle people to the nearest shelter. Hotels begin vertical building evacuation (i.e. Waikiki area) or horizontal, inland evacuation of its guests. Utility companies begin to reduce coastal power plant operations and adjust the power grid. The Red Cross begins to mobilize for statewide manning and supplying of public shelters.

PTWC issues a Tsunami Warning cancellation when destructive waves have ceased. If a destructive tsunami has struck the Hawaiian Islands, search and rescue (SAR) operations commence along the coastlines and at sea. An "All Clear" is broadcast after SAR operations are completed and County Civil Defense officials determine it is safe to return to the coastlines. The issuance of an all clear could take several hours because roadways could be blocked with debris.

Finally, Post Tsunami Survey Teams are contacted and mobilized for deployment to the coastlines to conduct wave inundation and run up field measurements. These teams were pre-selected, trained and issued clearance badges by HSCD to conduct their field operations.

4. PRESENTATIONS BY NATIONAL EXPERTS

Presentations were given by BMG, LIPI and BAKORNAS/BAPPENAS. The powerpoint presentations are available upon request.



5. VISITS

VISIT TO BAKOSURTANAL AND TOUR OF FACILITIES, 30 August 2005

During the visit, presentations were made by the Head of the Agency and by the Tsunami Experts. The visit also included tours of the BAKOSURTANAL sea level laboratory, geodynamic laboratory, marine mapping laboratory, and land mapping laboratory.

PRESENTATIONS (available on request):

BAKOSURTANAL

National Coordination Agency for Surveys and Mapping (BAKOSURTANAL)

Rudolf W. Matindas, Head

TSUNAMI EXPERTS

SEA LEVEL MONITORING IN THE INDIAN OCEAN - IOC GLOSS UPGRADES

Dr Laura Kong, IOC ITIC Director

THE USE OF NUMERICAL MODELLING AND GRAPHICAL INFORMATION SYSTEMS FOR HAZARD ASSESSMENT AND PREPAREDNESS AS PART OF INTEGRATED TSUNAMI RISK MANAGEMENT

Dr Laura Kong, IOC ITIC Director

THE NOAA DART SYSTEM AND ITS USE IN NUMERICAL WAVE FORECASTING

David McKinnie, NOAA

VISIT TO PADANG CITY, WEST SUMATRA, INDONESIA FOR SEMINAR AND COASTAL TSUNAMI DRILL, 31 August 2005

The Mission visited the city of Padang to learn about the tsunami mitigation activities undertaken, including the development of tsunami emergency operations plans, observation posts, evacuation maps, shelters, and routes, and the practicing of these responses by a number of communities. The Mission experts provided additional information on local emergency response requirements through the description of actual examples of working system components, including the vital role of planned and practiced procedures to effect a rapid response within minutes before a local tsunami arrives.

In the morning, the team participated in a seminar with the local emergency management and disaster response organizations. A presentation was made on the efforts of KOGAMI, a student-based non-governmental organization which has carried out an impressive number of mitigation activities, including hazard and risk identification, evacuation, awareness, and drills under the guidance of faculty members of the University of Andalas and other institutions. These efforts have been recognized by members of SATLAK, SATKORLAK, and LIPI as important initial contributions to build tsunami preparedness.

In the afternoon, the Mission team observed a tsunami drill that practiced emergency aid and disaster response immediately after a tsunami wave impact at a beachside community.

Padang's tsunami awareness and preparedness activities are being viewed nationally as a pilot for the development of the nationally-deployed comprehensive tsunami mitigation programme.

PRESENTATIONS (available on request):

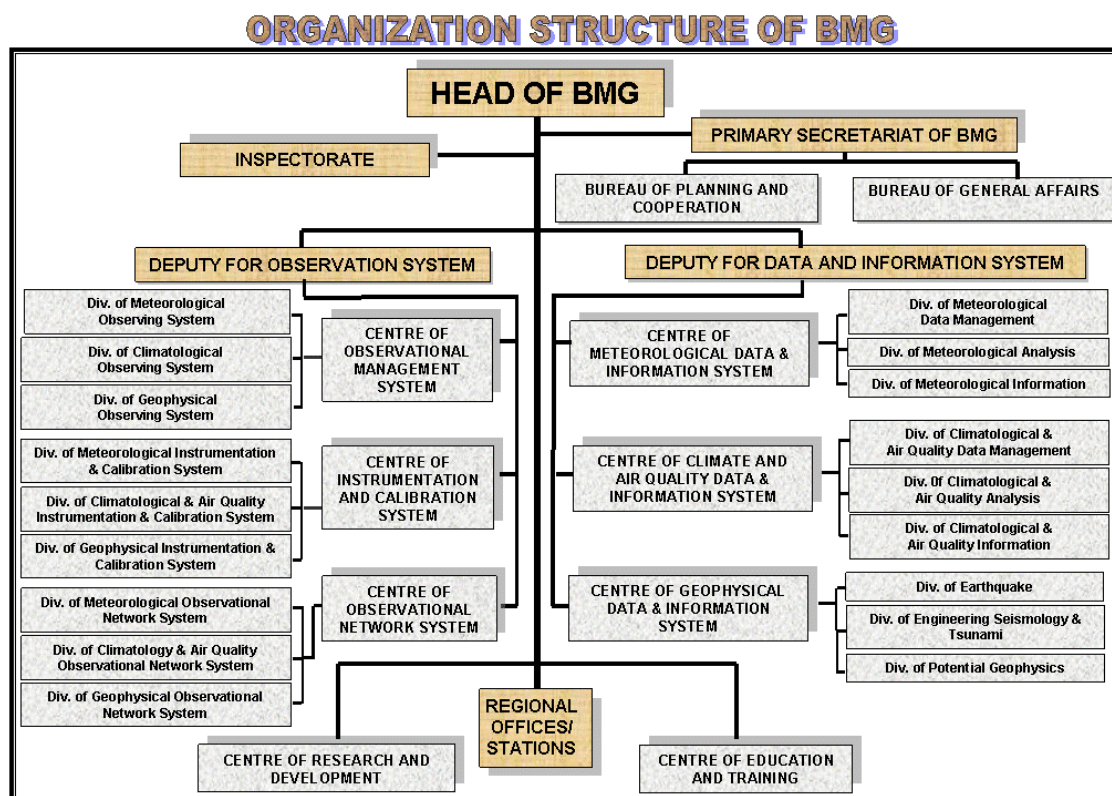
PADANG EMERGENCY RESPONSE
Local Tsunami Response Committee

PEOPLE-CENTERED RESPONSE AND ORGANIZATION
KOGAMI, Local Non-governmental Organization

TSUNAMI EXPERTS

PEOPLE-CENTRED TSUNAMI EARLY WARNING SYSTEMS: PUTTING CONCEPTS INTO PRACTICE
Dr. Laura Kong, IOC ITIC Director

TSUNAMI EMERGENCY RESPONSE - THE ROLE OF THE DISASTER MANAGEMENT ORGANIZATION AND THE IMPORTANCE OF STANDARD OPERATING PROCEDURES FOR EFFICIENT, RAPID RESPONSE.
Brian Yanagi, IOC ITIC Deputy Director



6. COUNTRY ASSESSMENT INTERVIEW - SUMMARY

Two questionnaires were available for review and discussion:

- Preliminary WMO questionnaire for National Meteorological and Hydrological Services for development of tsunami early warning and mitigation system in the Indian Ocean
- IOC country assessment questionnaire on tsunami warning and mitigation activities

The information obtained prior to the Mission was reviewed extensively during the meeting and corrected or complemented as necessary.

The revised version of the IOC questionnaire results is available in Annex II.

Section 1: CONTACT INFORMATION (name, address, phone, fax, e-mail)

The following national points-of-contact can be grouped according to the competency of the institution:

Technical work:	BMG	Mr. Prih
Capacity Building:	RISTEK	Mr. Idwan
Dissemination	BMG	Mr. Prih
	Kominfo	Mrs. Agnes
	BAKORNAS	Mr. Sugeng
Emergency response and preparedness	BAKORNAS	Mr. Sugeng

(subject to final approval of Draft Law)

Section 2: AUTHORITY AND COORDINATION

a. LEGAL FRAMEWORK:

A law on “national disaster management” is still being discussed between the Government and the House of Representatives.

- BMG has been designated to provide warnings (for earthquakes and tsunami, extreme weather, climate as well as air quality)
- Bakornas has been designated for disaster management and emergency response (for all hazards, not tsunami specific) including preparedness.

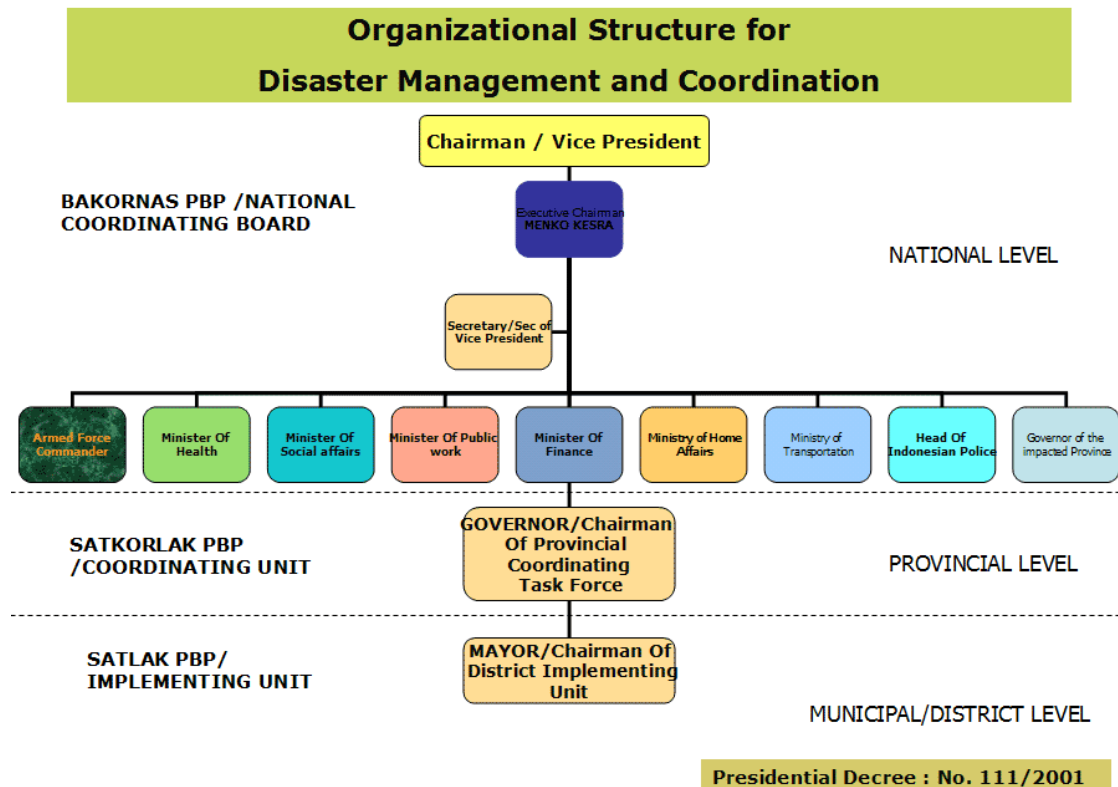
The Disaster Management Bill is under consultation between the government and the Parliament. Two public hearings were conducted, the first was on August 24, 2005 and the second was August 29, 2005. LIPI has proposed 3 new Articles on the Early Warning System and Preparedness, while other aspects related to it has also been proposed to be taken as basic principles and important dimensions which should not be overlooked, such as the public participation, private – public partnership, the international collaboration, the multi-hazards approach, the continuous monitoring, national and local council on disaster management, educational aspect, financial and industrial aspects, incentive system, and many other issues. For the time being, the Vice President has appointed the following responsible institutions: Early Warning System (Meteorology and Geophysics Agency – BMG), Public Education and Preparedness (Indonesian Institute of Sciences – LIPI), Dissemination and ICT (Department of Communication and Information – KOMINFO), Emergency Response (National Coordinating Agency for Disaster Response and Displaced People – BAKORNAS).

NATIONAL ACTION: Finalize the Disaster Management law and decrees with clear responsibilities and institutional arrangements for an end-to-end Early warning System in Indonesia. In particular clear delineation of the role of BMG with respect to generation of science based warnings and its interface with BAKORNAS, LIPI, other universities and local government institutions (responsible to the Ministry of the Interior) in relation to their responsibilities for dissemination and preparedness should be clarified in the law and associated administrative decrees.

b. NATIONAL PLATFORM FOR DISASTER REDUCTION:

There is national guideline/manual (but is out of date). Last version was 1997. This should be updated in the future.

In terms of a national coordination mechanism, an “informal” group has been created and has met several times. However this Group has not yet been “formalized” as a National Tsunami Warning and Mitigation Coordination Committee. It is expected that this will be included in the Ministerial Decree that is being discussed (see Question 2). The Group has developed a “Grand Scenario of Indonesian Tsunami Early Warning System” and will continue to meet. The below figure shows the expected organizational structure for disaster management and coordination:



NATIONAL ACTION: Constitute a multi stakeholder National Tsunami Warning and Mitigation Co-ordination Committee, with legal responsibilities for an end to end Tsunami early warning system

A similar coordination mechanisms exists at the community level. It is represented by the Satkorlak at the Provincial level and Satlak at the Kabupaten (District/County) or Municipality level. These are under BAKORNAS. In the case of Padang City in West Sumatra, the Municipal Government has restructured recently a specialized service unit directly under the Mayor, called the Social Welfare and Disaster Management Service (formerly was Social Welfare and Fire Disaster Service).

The Chairman of this committee normally is the appropriate Army Commander at the respective level. He reports directly to the Governor or the District/County Head or the Mayor. The members consist of representative of the relevant sectors, such as the Police, Public Works, Health Service, Social Welfare, Civil Defense, Local Logistics Service, Water Supply Company, Electricity Company, Telecommunication Company, etc.

Bakornas has 3 tasks:

- Policy formulation
- Coordination of implementation
- Provide guidelines and directives

As such it has decision-making and policy-making authority. At the provincial and local levels Satkorlak and Satlak implement the decisions of Bakornas.

c. NATIONAL ORGANIZATIONS:

Important organizations for the implementation of a tsunami early warning and mitigation system include the following:

- BAKORNAS PBP: is a national coordinating board for disaster management, chaired by the Vice-President
- SATKORLAK PBP: is provincial coordinating unit for disaster management, chaired by Governor in the respective area;
- SATLAK PBP: is a district or municipal implementation unit for disaster management, chaired by Bupati or Mayor of the city.

Elements Institutions	Warning guidance and dissemination	Public awareness	Preparedness	Rapid response
BAKORNAS		√	√	√
BAKOSURTANAL	√		√	
BASARNAS				√
BMG	√			
BPPT	√		√	
DIKNAS		√		
DKP			√	
ITB		√	√	
KRT		√		
KOMINFO	√			√
LAPAN			√	
LIPI		√	√	
Media	√	√	√	√
NGOs		√	√	√
PEMDA		√	√	√
SATLAK				√

NATIONAL ACTION: Under the new disaster management act, designate and provide capacity to over arching mechanism for Disaster Management which currently is Bakornas . This entity should develop standard protocols (standard operating procedures) for different disasters including updating existing ones with recent experiences.

NATIONAL ACTION: It is recommended to better define the role of the governmental and non-governmental agencies/organizations, community service organisations involved in disaster preparedness and response including tsunami hazard. In particular develop standby arrangements with the Indonesian Red Cross society for community preparedness and last mile warning dissemination.

NATIONAL ACTION: As Indonesia has undertaken substantial decentralisation in its governance since 2001, it is critical to make provisions for increasing capacity and designating responsibilities for preparedness and early warning dissemination and implementation of standard operating procedures regarding response to early warning at the District (Kabupaten) through the Satlak and sub district levels (Kecamatan)

A number of Government and non-government organizations undertake research and development for the development of the tsunami warning and mitigation system. (See question 9 in Annex II). The activities of these agencies can be seen in the following table:

- Emergency response: BAKORNAS (<http://www.bakornasppb.go.id>) and IFRC/PMI (<http://www.palangmerah.org>) and BASARNAS (<http://www.basarnas.go.id>) and Ministry of Health (<http://www.depkes.go.id>)

- Meteorological services: BMG (<http://www.bmg.go.id>) and LAPAN (<http://www.lapan.go.id>)
- Community preparedness: LIPI (<http://www.lipi.go.id>) and Depdagri (<http://www.depdagri.go.id>) and IFRC/PMI (<http://www.palangmerah.or.id>)
- Capacity building: Ristek (<http://www.ristek.go.id>)
- Tsunami modeling: ITB (<http://www.itb.ac.id>) and BPPT (<http://www.bppt.go.id>) and BMG (<http://www.bmg.go.id>)
- Sea-level monitoring: BPPT (<http://www.bppt.go.id>) and Bakosurtanal (<http://www.bakosurtanal.go.id>)
- Deformation monitoring: Bakosurtanal (<http://www.bakosurtanal.go.id>)
- Survey vessel: BPPT (<http://www.bppt.go.id>) and LIPI (<http://www.lipi.go.id>)
- Dissemination of information: Kominfo (<http://www.depkominfo.go.id>) and IFRC/PMI (<http://www.palangmerah.org>)
- Institutional Development: Ristek (<http://www.ristek.go.id>) and BMG (<http://www.bmg.go.id>)

(note: discussions are ongoing as to whether institutional development requires a separate activity or can be incorporated in capacity building)

	ACTIVITIES	AGENCIES
1	Earthquake monitoring	BMG, Dep. ESDM
2	Sea Level Monitoring	BPPT, BAKOSURTANAL, DKP
3	Database and Tsunami Simulation	BPPT, ITB, UGM, BMG
4	Deformation Monitoring	BAKOSURTANAL, LIPI
5	Survey vessel	BPPT, LIPI, DKP
6	Dissemination of information	Dep. Kominfo, KNRT, BPPT, LAPAN
7	Development of Institution	RISTEK, BMG
8	Capacity building	RISTEK, BAPPENAS, KLH
9	Community Preparedness	Depdagri, LIPI, Bakornas PBP

d. PRIORITIES:

Because the nature of tsunami in Indonesia is of both local and regional type, strengthening community preparedness and increasing public awareness along with dissemination of warnings are considered to be the top priorities for Indonesia in the establishment of tsunami early warning systems.

We have selected Padang City as our first priority, by implementing end-to-end system and involving the whole institutions (central and local government), international organizations and donor countries, local NGOs, public and schools, the scout. Padang will be our first Pilot Project. The success and lessons learned from this City will be replicated and upscaled to another threatened coastal cities in the country and shared with the neighbouring and other countries in the world.

The following major activities are currently taking place to address these priorities:

1. RISK MITIGATION STRATEGY

- Improving Urban Development Processes: This strategy is directed toward improvement of the safety of the built environment by controlling the process of urban development at the macro and micro level. This will be dealt with by public works department [will need to be member of NTCC];
- Strengthening of Emergency Management Institutions: The strategy is focused at improving the legal and institutional framework of the disaster management unit;

- Raising Public Awareness: Raising public awareness is achieved through various public campaign activities for disseminating information and through public education program and training.

This will be realized as follows:

- IMPROVING URBAN DEVELOPMENT PROCESSES
 - Review of Spatial Plan with regard to seismic safety
 - Review of Local Building Regulation
 - Development and implementation of Building Monitoring System
- STRENGTHENING OF EMERGENCY MANAGEMENT INSTITUTIONS
 - Improvement and socialization of Disaster Management (DM) Standard Operating Procedure (SOP) and Establishment of Local Emergency Operation Center
 - Preparation of City Emergency Response Plan for Earthquake
 - Analysis and development of National Policy for Urban Disaster Mitigation
- RAISING PUBLIC AWARENESS
 - Preparation and development of guidelines and information of mitigation measures
 - Disaster public awareness campaign by educational broadcast
 - Public Education campaign for Earthquake Hazard Awareness

2. TRAINING ACTIVITY

- Disaster Journalist training
- Building monitoring system training
- Training for trainer on Earthquake School Preparedness Program
- Training for management of the coastal and sea tourism areas

e. INTERNATIONAL STANDARDS ASSISTANCE:

Assistance is required to harmonize existing standards and protocols in data collection, evaluation, and warning communication with those utilized by the global system to ensure interoperability

REQUIREMENT: Assistance is required to harmonize existing standards and protocols in data collection, evaluation, and warning communication with those utilized by the global system to ensure interoperability. It is recommended that the ICG/IOTWS takes this matter into consideration when developing its capacity building.

f. REGIONAL COOPERATION – EARLY WARNING:

Indonesia cooperates with neighboring countries when evaluating earthquakes and monitoring tsunamis in real-time, through ASEAN. BMG is the home for the Asean Earthquake Information Center (AEIC), which relays tsunami information from JMA and PTWC to ASEAN countries. Under the ASEAN Committee on Science and Technology (COST), the sub-committee on Meteorology and Geophysics has plans for the exchange of seismic wave forms. In mitigation issues, universities in Indonesia obtain funds from various international organizations to carry out research and activities in urban disaster management (please also see Question 11). Note that Indonesia has agreement with Malaysia to exchange data for 5 stations. Within the ASEAN activity, we have had two workshops to discuss about data exchange and warning/information exchange. The dry-run of tsunami warning on 29 of July has given quite a promising results (see picture below)

SMS
SEND TO

DRY-RUN TSUNAMI WARNING BMG INDONESIA
29 JULI 2005 03:00 UTC

SING	MALAY	BRUNEI	PHILIP	THAI	VIETNAM	LAOS	KAMBOJA	MYANMAR
✓	✓	✓	✓	✓	✓	✓	X	X
RECEIVE								
SING	MALAY	BRUNEI	PHILIP	THAI	VIETNAM	LAOS	KAMBOJA	MYANMAR
✓	✓	X	X	X	X	X	X	X
FAX SEND TO								
SING	MALAY	BRUNEI	PHILIP	THAI	VIETNAM	LAOS	KAMBOJA	MYANMAR
✓	✓	✓	✓	✓	✓	✓	X	X
RECEIVE								
SING	MALAY	BRUNEI	PHILIP	THAI	VIETNAM	LAOS	KAMBOJA	MYANMAR
✓	X	X	X	X	X	X	X	X
EMAIL SEND TO								
SING	MALAY	BRUNEI	PHILIP	THAI	VIETNAM	LAOS	KAMBOJA	MYANMAR
✓	✓	✓	✓	✓	✓	✓	X	X
RECEIVE								
SING	MALAY	BRUNEI	PHILIP	THAI	VIETNAM	LAOS	KAMBOJA	MYANMAR
✓	✓	✓	✓	✓	✓	X	X	X

Program Activities	Institutions												Output
	KRT	LPND	BPPT	DIKNAS	ITB	SATLAK	BAKORNAS/ SATKORLAK	DEPSOS	PMI	KOM INFO	PEMDA	DEPDAGRI/	
Early Warning													
Warning issuance													Reliable warning as quick as possible, released by the authorized institution
Public awareness													
Public campaign and education													Change in attitude towards “living peacefully” with hazards and the ability to accept further change towards preparedness
TOT													Knowledgeable and improved skill on disaster risk and mitigation, preparedness to react properly to true as well as false alarm, disseminate the skill and knowledge
Vulnerable groups training													Improved skill and knowledge to avoid and reduce the risks
Hazards assessment													
Bathymetry mapping													Bathymetry maps on operational scale for appropriate modeling purpose
Topography and land cover													Detailed topographical maps and types of land cover, infrastructures and related information
Inundation maps													Detailed and operational inundation maps, based on modeling, with information on depth of inundation and estimated tsunami current speed
Vulnerability assessment													
Social-economic and													GIS-based social-economic and environmental profiles and statistics of vulnerable areas,

environmental baseline																infrastructures and population at risk
Risk assessment																GIS-based detailed delineation of areas, magnitude, rate and types of risks and arrival time of disaster which may strike particular areas, population, and sectors
Damage assessment																GIS-based damage and loss estimate (death toll, loss of property, environmental damage) and estimated value of the possible total loss
Evacuation maps																
City scale																1:25.000 or greater scale map of city evacuation map showing major evacuation route, possible isolation due to earthquake shake, congestion, major pool of shelter areas, horizontal and vertical evacuation route/sites, and other relevant emergency infrastructures
District scale																1:10.000 or greater scale map of district/kecamatan scale, being part of the integrated city scale with detailed information on emergency and relevant signs of escape route
Village scale																1:5000 or greater scale map of village/kelurahan scale, being part of the integrated city scale with detailed information on emergency and relevant signs of escape route
Contingency plan																
SOP																Detailed standard operating procedure, derived from the previous related information, scenarios and possibilities as well as the possible risks and damage, addressing the “dos” and “don’ts” of the emergency managers, population (from family to the crowds scales) in any particular endanger areas, particular time and particular economic sectors
Rapid response																
Emergency planning																Conversion of SOP to emergency plan which must be understood, practiced and mastered by the emergency managers, every single person, family member, population, economic sectors as well as the vulnerable groups
Drilling and simulation																Mastery in the practices when emergency happen at any time and place, and the ability to disseminate the skill and knowledge

g. REGIONAL COOPERATION – ASSESSMENT & MITIGATION:

see f above

h. RESEARCH EXPERTISE:

Indonesia has active researchers in seismology or tsunamis. The current activities include:

- Tsunami modeling
- Decision Support Systems for early warning
- Micro-zonation
- Spatial planning
- Evacuation mapping
- Up-grading buoys and tide gauges
- Seismotectonic

- Seismic tomography
- Earthquake engineering
- Instrumentation development

We have been very active in doing research in seismology and tsunami research. Our research on (paleo)seismology and tsunami in Sumatra and other parts of the country have been referred by the international scientific community and been used further to design the tsunami warning system in the Indian Ocean. Our presentations in the Beijing, Phuket, Paris, Mauritius and Paris Meetings illustrated how our contributions have been for the establishment of the IOTWS. Indonesia is also an active member in the ITSU Pacific Tsunami Warning System. We have recently jointly organized (with JSPS, and Caltech) a quite successful International Meeting on Sumatran Earthquake Challenge (materials available on request) in August 24 – 28, 2005. The meeting was attended by outstanding scientists from the US, Japan, France, UK, India, Germany, and Indonesia. The meeting resulted in a declaration/recommendation (summarized in the presentation given to the Team Leader). Full text available on request.

There are many government-sponsored research organization that can provide products or services to strengthen the tsunami warning and mitigation system. Among others are BMG (seismology, produces earthquake information), National Coordinating Agency for Survey and Mapping – BAKOSURTANAL (maps, tidal data, GPS, geodetic network, remote sensing), LIPI (research on (paleo)seismology, tsunami, other earthquake related prediction research, marine geology and geophysics, physical oceanography, remote sensing products, public awareness and preparedness, GPS, etc.), Agency for Technology Assessment and Application – BPPT (marine geology and geophysics, remote sensing, physical oceanography, tsunami modeling), Bandung Institute of Technology – ITB (seismology, tsunami modeling and database, earthquake engineering, public education on hazards), National Institute of Aeronautics and Space – LAPAN (remote sensing images and analysis), Research Agency for Marine Affairs and Fishery – BRKP (remote sensing, tsunami and coastal hazards), Marine Geology Institute (marine geology and geophysics, coastal resources maps).

Section 3: TSUNAMI WARNINGS AND TSUNAMI MONITORING

a. RECEPTION OF WARNINGS FROM INTERIM SYSTEM

Indonesia receives international tsunami warnings for teletsunamis from the Pacific Tsunami Warning Center, from the Japan Meteorological Agency and from the ATWC. They are received by TELEPHONE, SMS, FAX, EMAIL AND GTS: NSC National Seismological Centre (of BMG) (underlined indicates primary method. There is currently no alert system to indicate arrival of message. GTS is quicker but access to GTS at the location of the centre is not ideal – no direct display of GTS messages at seismic centre; data access through LAN is available).

The agency provides a 24/7 service.

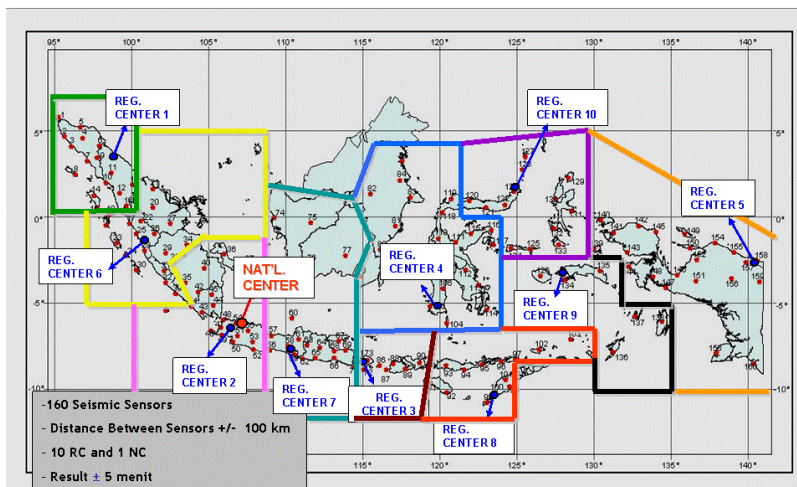
Note: Dr Kong referred to EMWIN as an effective way to capture GTS messages. It was recommended to set up an EMWIN station at seismic centre.

b. NATIONAL TSUNAMI WARNING CENTRE

BMG already acts as focal point for Indonesia. It is planned for BMG to host the national tsunami warning centre (there will be 1 national centre and 10 ‘sub-national’ centres). It already hosts the ASEAN earthquake information centre (AEIC). The target date for the formal establishment of the national TWC is 26 December 2005. It is expected that 3 sub-national centres will be established this year in North Sumatra, Bali, and Papua. See map below.



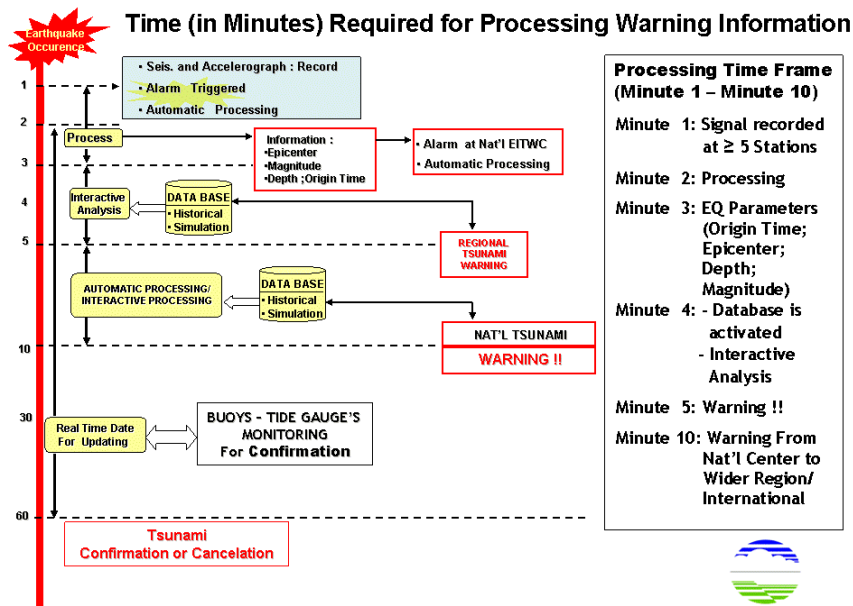
Indonesia Earthquake Information and Tsunami Warning Center (LONG TERM / START 2006)



Seismic monitoring system: before end of 2005 expect to install 25 stations; tide gauge: as part of IOC programme, stations to be installed also before end 2005; before end of 2005 and early 2006, Germany funded deep ocean sensors will be installed).

Currently the national tsunami warning centre (at BMG's NSC) issues EQ information only. There are plans to provide tsunami warnings using real or near real-time sea level data.

The sub-national centres will also have the capability to issue tsunami warnings in their own and adjacent areas as shown in the above figure. The backup to the national centre is a sub-national centre located close to Jakarta.



Note: timeline is indicated above

For national dissemination BMG is the centre. For regional dissemination, under ASEAN, the AEIC earthquake parameter information and tsunami information from PTWC, JMA and ATWC is currently shared. Under ASEAN there is a plan for the sharing of seismic wave form data. The

planned stations are shown in the figure below. Implementation of upgrades, necessary for sharing, are the responsibility of each country.

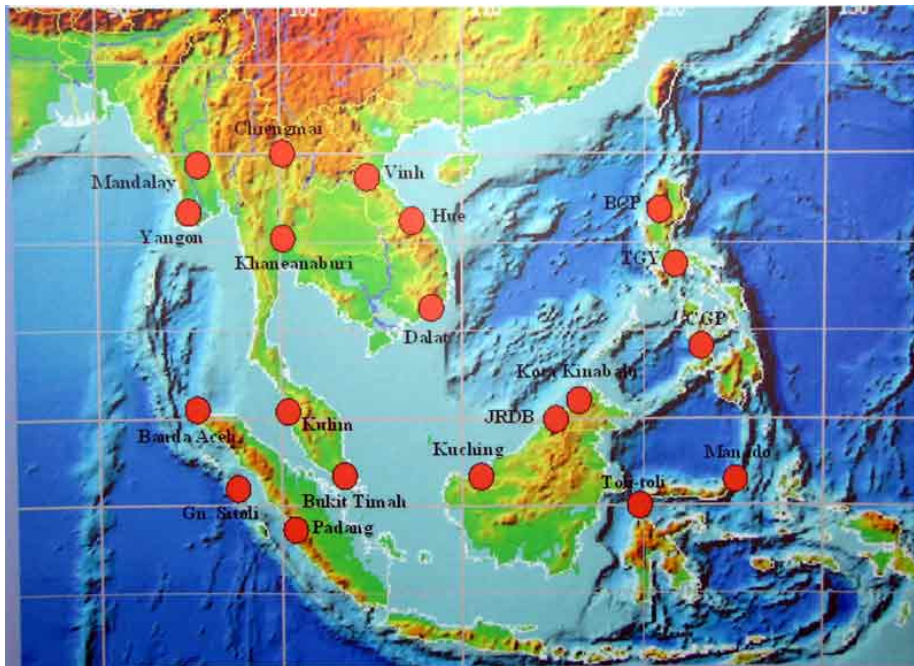


Figure: proposed ASEAN supported exchange of seismic wave form data

Presently two staff are always present. In November a third person will be added. In the event of a significant earthquake, 2 additional staff can be called in, as well as the Officer-in-charge.

NATIONAL ACTION: *Agencies have done an excellent job of identifying the individual components of an effective TWS and some agencies have considered an overall conceptual framework. However, a true national strategy for developing and implementing an end-to-end system including:*

- *Instrumentation requirements*
 - *Array design of instrumentation*
 - *Redundant communications infrastructure*
 - *Contingency planning including back up infrastructure, systems and centres*
 - *Initial response*
- appears to require further development.*

Indonesia should develop a national strategy and implementation plan that integrates all separate components into a holistic design that includes all operational agencies. The system should be consistent with the interoperability standards of the ICG/IOTWS.

Similarly, much progress has been made on individual operational components. A national operational directive should be developed that clearly outlines the authority, purpose, staff and agency responsibilities, communication links, procedures and protocols. It should include explicit procedures and checklists for action.

c. TSUNAMI WARNING ALARM INFRASTRUCTURES

To notify staff of tsunami alarm events, currently cellphone (SMS/voice call) and fixed phone (voice call) are used. For $M > 5$ SMS messages are broadcast to BMG staff. For $M > 6$ officials in relevant agencies are contacted by SMS as well. Voice calls are made for “significant” events (ie events with potential destructive impact: shallow felt and offshore). For $M > 7$ Ministers will be informed by SMS (eg Minister of Sci and Tech, Comm. & Information; Min of Transportation; Office of the President;

Minister of Internal Affairs). At this moment no dedicated/reserved telephone lines are available. There is a cellphone of which the number has only been provided to certain officials (unregistered number). Currently no radio system is available. Police uses VSAT for communication at national level. For local level VHF is used.

Note: recommended to involve police to handle liaison if national telecom system has collapsed.

NATIONAL ACTION: *The operational directive should include exactly when (under which criteria), how (via which specific communication channels) and who (which individuals and agencies) should be contacted. This should be in place at the national, sub-national and local level.*

The current alarm infrastructure uses commercial services. It is planned to use a custom system (using radio link at local level, satellite system at national level).

d. SEISMIC NETWORK

Indonesia operates seismographic stations to monitor regional seismicity

NATIONAL ACTION: *see commentary on national strategy and operational directives*

The current network is supplemented with stations from the GSN. (eg Diego Garcia). The data used by the new automatic processing system uses data from Australia, Malaysia, etc. See below figure for the network of regional stations used.

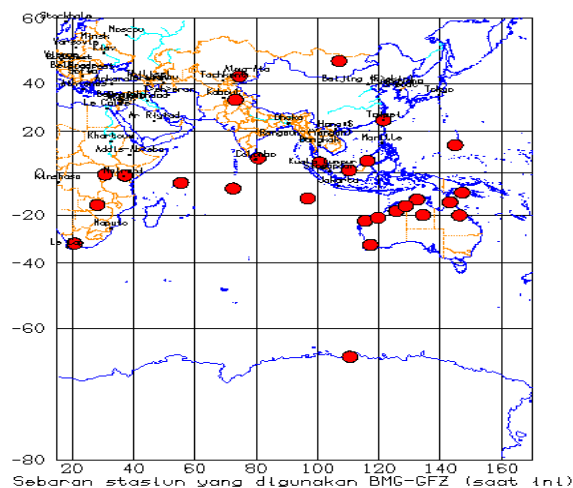


Figure: regional network uses by the automatic system

The data are available in real-time: (Banda Aceh (BSI), Parapat (PSI), Gunung Sitoli (GSI), Jayapura (JAY), Padang Panjang (PPI), Kappang (KAPI) will all be available internationally by the end of September 2005).

NATIONAL ACTION: *continuous, immediate broadcast of high quality data needs to be made available to other interested warning centers (including JMA and PTWC).*

GSN station data are already available to all. For the Indonesian (donor supported) national network data are shared with each donor. Other national requesting data will need to consult with the relevant donor country and Indonesia.

e. UTILIZATION OF SATELLITE SYSTEMS FOR MONITORING, DATA COLLECTION AND DISSEMINATION

Through LAPAN (National Space Agency) and other government agencies, Indonesia operates several satellite remote sensing ground stations to capture data from different satellite such as Landsat, Spot, Terra/Aqua-Modis, NOAA-AVHRR, Feng Yun, and with International collaboration (Acris-Australia, Macris-Malaysia, Crisp-Singapore, Gistda-Thailand, Jaxa-Japan, USGS-USA, etc) LAPAN can provide high resolution satellite data such as Spot-5, Ikonos, Quickbird, ALOS (in the future), and Indonesia soon will launch micro satellite for quick surveillance. Beside those capabilities, Indonesia through state government and private companies operates several telecommunication satellites (Palapa-C, Telkom-1, etc) to cover and connect the whole of Indonesia territory and regions. Indonesia uses satellites for transmission of collected seismic, sea level and GPS data. Currently these data are not immediately available for use in tsunami response.

Indonesia through LAPAN and other agencies operates some small and large size antennas with 2.5 m, 10m and 11m diameters using X band, C-Band, S-Band and L-Band receiver capabilities. Some of them are located in Biak (Papua), Parepare (Sulawesi), Samarinda (Kalimantan), Rumpin (Bogor), and Jakarta. The processing, analyzing and image interpretation work is conducted mostly in Jakarta and other sites. The facilities are equipped with a SGI/Irix System, several Work Stations, plotters and scanners for data reproduction. Data/Information archiving and dissemination services are provided at near real time and on-line, through internet services (for high temporal resolution satellite data i.e : Terra/Aqua, NOAA). Some research activities related to remote sensing applications, especially for hazard monitoring such as drought, forest fires, and floods have been done for a decade. These activities utilized multi-temporal satellite data such as NOAA-AVHRR, Terra/Aqua MODIS. LAPAN and other agencies such as the Ministry of Forestry have archived NOAA-AVHRR Data for over twenty years, and these have been distributed to other research agencies such as Bogor Agriculture University, University of Udayana, University of Sriwijaya etc.

Related to the tsunami in NAD-Aceh, LAPAN provided satellite data which were utilized for quick response activities, rough vulnerability assessment, and quick evaluation of the impact of the tsunami. Some high resolution satellite data provided by international agencies have been reproduced and submitted to the government coordinating agency (Bappenas), BPN etc.

Note: It was not known how long it took for data to become available (hours, days, weeks)

Now, with other National agencies (BMG, LIPI, BPPT, Bakosurtanal, Bakornas etc), LAPAN will provide LUC (land use coverage) data derived from high resolution satellite imagery for Padang City (as the Pilot Project Site), especially for the TEWS preparedness program.

Note: The team inquired how MODIS satellite data are received. No answer was available.

NATIONAL ACTION/REQUIREMENT: A strategy needs to be put in place for acquiring and using remotely sensed data in a warning and response environment. This may require approaching international space agencies to develop an agreement for receiving high resolution geospatial data in a timely manner. In addition, processing of local received satellite data needs to be made more expediently. An overall plan for improving processing and especially distribution between agencies needs to be implemented.

The following satellite systems are used: Voice, Text and Image data can be transmitted via National Satellite (Palapa-C, Telkom-1) as a repeater through VSAT provider (CSM, Lintas Arta). The data will include – Seismic data, VSAT IP and VSAT Link to other operation/warning centers. Remote Sensing satellite systems (Landsat, Spot, NOAA, Envisat, etc) have been utilized to provide geospatial data with certain sensor capabilities from optical to radar sensors. This data can describe the condition of tsunami affected area after conducting some processing, analyzing, and interpretation. It was not clear whether this is currently implemented by Indonesia.

Some satellite technology has been utilized for hazard monitoring and geo-spatial data collection at moderate level. Problems relate mostly to financial and infrastructure limitations, as well as coordination to maximize the use of both telecommunication and remote sensing satellite technologies. In the future, both satellite technologies can be integrated for the benefit of hazard monitoring national program. It was not clear whether there are plans to improve the situation.

e. SEA LEVEL NETWORK

NATIONAL ACTION: refer to overall comment about the national strategy, particularly in regard to optimization of tide gauge location for tsunami warning.

Indonesia operates 60 permanent sea level stations with the existing station distributions, including the proposed additional stations, as can be seen in the figure below. An additional 60 real-time stations are planned. Under the GLOSS programme, with cooperation from NOAA, 9 existing stations (of the existing 60) are planned for upgrading in 2005 and 2006. One station (Sibolga) has already been upgraded recently in April to near real-time mode transmitting to GTS. 25 of the existing 60 stations are digital stations (digital recording) with dial-up capability. 35 stations are analog stations requiring manual digitization. The Sibolga station located on the west coast of Sumatra has been operating in real time mode since 22 April 2005, and there are 25 stations in near real time mode using telephone cable connections. Sibolga station data are already shared and available to PTWC/JMA for use in the IOTWS. Other new planned station data will also be shared through the IOTWS. Other station data (of existing stations) will be made available upon request from Bakosurtanal. All real-time sea level station data (transmitted through the GTS) collected in Indonesia coastal waters along the Indian Ocean and Pacific Ocean will be available for tsunami warning purposes through the IOTWS and ITSU respectively. Both the real time (using GTS) and digital on line stations (dial-up) are operating in high sampling rate less than 1 minute. The former transmit the data every 15 minutes with facility capable of triggering the system to send the data more immediately if any extreme sea levels such as tsunami might occur while the latter are downloaded via telephone modem weekly.

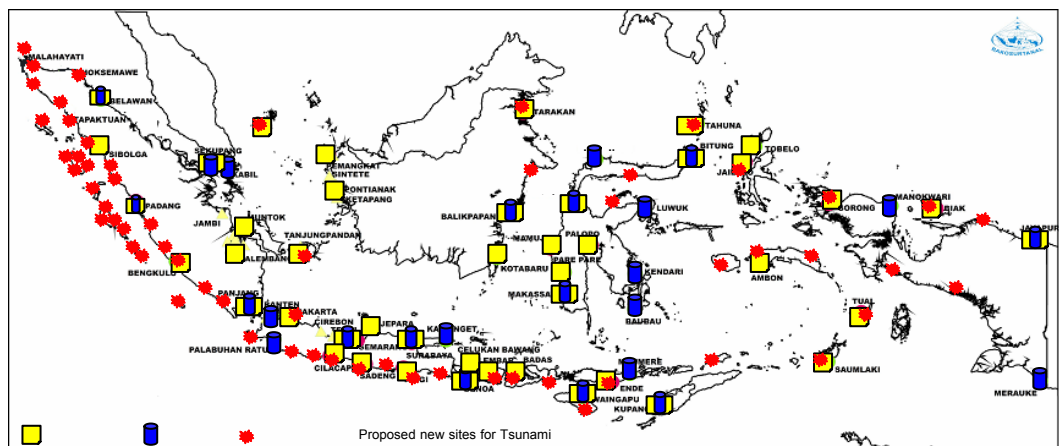


Figure :National Sea Level Monitoring Network of Indonesia

The system data flow of graphical chart and digital with cable telephone can be seen in the figure below. Bakosurtanal, the responsible institution operating the network, carry out data processing and analysis based on GLOSS standard. Currently there is no capability at BMG or Bakosurtanal to download GTS transmitted data, decode and display them in real-time.

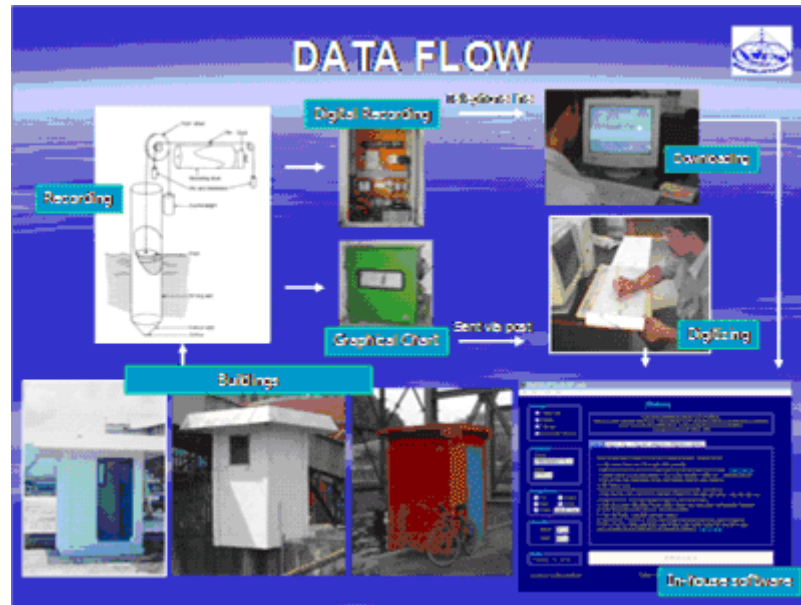


Figure :Data Flow of Sea Level Monitoring System

DART:

See below a draft site location map (proposed by BPPT) for the planned deep ocean pressure sensors. This will be discussed in more details with the donors (Germany, Norway) who have offered support through the provision of deep ocean pressure sensors. Germany will undertake a site survey starting October 2005 of the Indian Ocean side to determine suitable locations.

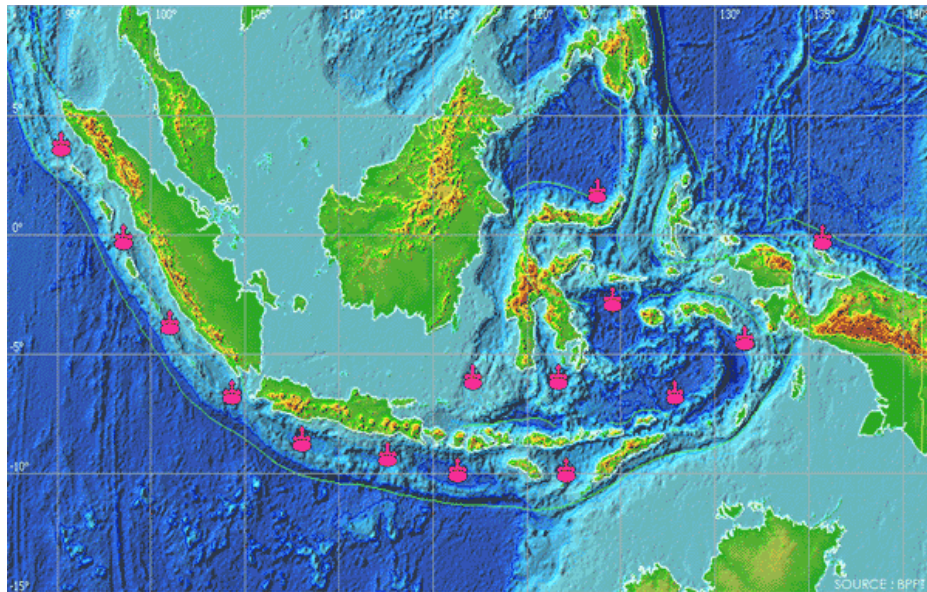


Figure : Proposed DART buoy network

f. INTERNATIONAL COORDINATION

The following agencies cooperate with Indonesia to improve the national tsunami warning system:

DEVICE/ ACTIVITY	PLANNED	EXISTING	INTERNATIONAL COOPERATION
Seismograph	160 units (real-time)	58 units (short period) 30 units non real-time And 28 units real-time	Germany 20 units China 10 units Japan 15 units CTBTO 6 units

			USA USGS, Caltech: 6 station upgrading including real-time satellite telemetry France: TREMORS software
Accelerograph	500 units	-	-
Tide gauge	120 units of digital tidal recording	60 units (35 analog, 25 digital)	Germany: 5 tide gauges
DART buoy	15 units of buoy with sea floor bottom pressure sensor	12 units to only monitor sea & environment	Germany: 10 surface buoys, 20 BPS Norway: 5 surface buoys, 5 BPS
GPS	Continuous GPS (27 GPS near tide gauge, 10 GPS near buoy)	9 units operated by Bakosurtanal (see figure) 24 units installed by Caltech and operated by LIPI and Caltech	Germany: 10 coastal GPS stations (see figure) USA USGS, Caltech: upgrade of 8 existing Caltech stations to real-time telemetry
Centre	1 national centre 10 regional centre	5 regional centres	-
Numerical modeling	Inundation mapping Tsunami simulation	See questions 73, 74, 75, 82	Tohoku University Hokkaido University Tokyo University

Note: the meeting took note that there are other countries who are already, or have expressed interest in providing additional support (eg Australia, France, USA – USTDA, Japan)

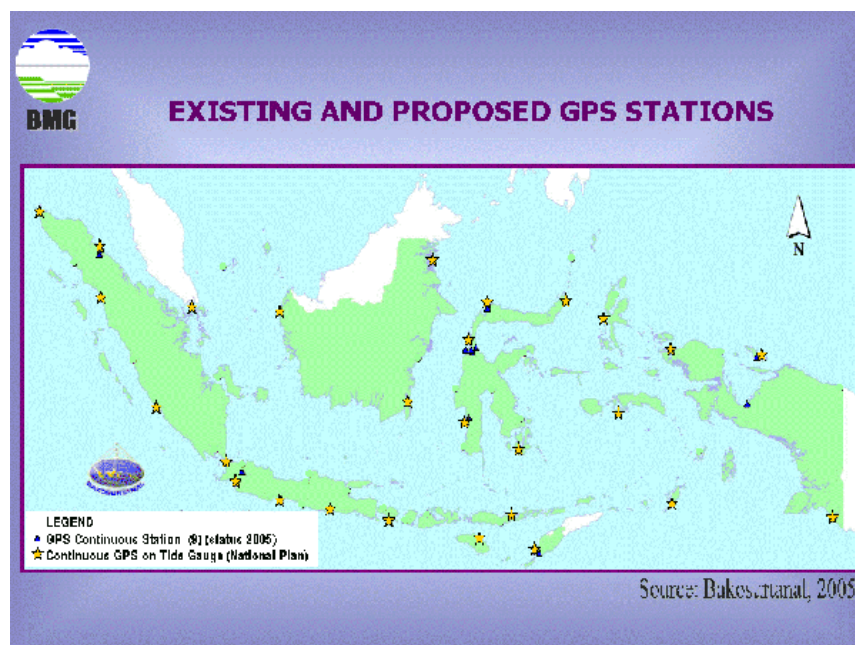


Figure: existing and proposed GPS stations (does not include existing or planned Caltech stations)
don't be shown

Note: a number of cooperative research activities are occurring augmenting existing national network. Discussions are required to determine whether these will become part of the permanent monitoring network.

Note: no information available on planned location of Norway BPS. A German RV will do a site survey starting in October to determine best locations for the BPSs.

NATIONAL ACTION:

- 1. In order to enhance the national network capability, the seismic and sea-level stations should be updated in coordination with the activities of WG-I and II (Seismic network and Sea-Level network, respectively) of the ICG/IOTWS.***
- 2. The mission team noted that improvements in response time and reduction in the potential for human error can be accomplished through the implementation of automated processes. For example, improvements are possible for more rapid determination of earthquake locations and magnitudes, and message logging and dissemination.***
- 3. The NETWC should consider the implementation of moment magnitude methodologies for determining earthquake magnitude. These include Mwp, moment magnitude based on the 1st arriving P-wave, which provide very rapid estimates. The PTWC feels that Mwp is reliable for regional and teleseismic distances, but notes that it is important to calibrate the methodology using existing historical data in order to determine whether empirically-derived corrections are required especially for the local implementation.***
- 4. National sea level network data will be sent in real or near-real time by VSAT or the through the WMO GTS to the NETWC. The NETWC should have the capability to display and manipulate these records (zoom, pick amplitude/period, remove tide/detrend, etc), and the capability of downloading all other available Pacific and Indian Ocean sea level data available over the GTS. The PTWC has offered to provide software for the decoding of the currently non-standard data formats that are provided by various satellites. The IOTWS WG-II and the ITIC are working together with the WMO to make sure that sea level data is rebroadcast and made available for download by all IOTWS NMHSs.***

Section 4. TSUNAMI WARNING RESPONSE AND EMERGENCY PREPAREDNESS

a. WARNING DISSEMINATION AGENCY

At this time there is no warning dissemination agency. Proposed is as follows: BAKORNAS (national); then down to provincial (Satkorlak) and district level (Satlak) and then to community. Currently, BMG will send information also directly to Satkorlak and Satlak. The Department of Communication and Information (KOMINFO) was appointed to be responsible for ICT component and has begun to discuss exercises with telecom providers and radio.

BAKORNAS has authority by law through a Presidential Decree). This will be strengthened by the proposed law (see above). Note that at this time there are no “standard operational procedures” available that designate the role of all agencies.

BAKORNAS does not issue public evacuations (at national level) but the provincial (Satkorlak) and district level (Satlak) agencies do issue public evacuation. Note that the Army is member Satkorlak and Satlak.

b. CAPACITY BUILDING ASSESSMENT

A partial capacity assessment has been done, mostly of the technical expertise needed by LIPI. However a comprehensive assessment of capacity deficits in all the relevant sectors of Disaster management has not been attempted. The technical capacity assessment by LIPI provides the following gaps and deficits

Recommendations include:

- Design education and information programs on disaster awareness and preparedness.
- Develop capacity and skills and strengthen coordination systems for disaster management.

- Develop community disaster management programs that involve local government, and other agencies
- Improve capacity to provide early warning system.
- Develop national disaster preparedness plan and contingency plans.

Summary of Capacity Building and Preparedness:

■ **Existing capacity**

- Essential capacity (core group) of basic research on geodynamocs, (paleo)seismology, earthquake engineering and tsunami related research (modeling, database, paleotsunami) and relevant technology and system
- Customized public education and preparedness expertise and experience
- Good network of research, monitoring, technology and public education and preparedness
- Organizing public education and preparedness training and workshop for the nation and the neighbouring countries

Human resources needs:

S3 seismologist: 33 persons
S3 geophysicist: 11 persons
S3 oceanography: 11 persons
Minimum D3: 180 persons

NATIONAL ACTION: A comprehensive assessment of the capacity needs of all stakeholders, including NGOs, in disaster management should be undertaken participatively involving all local Government institutions like the Kabupatens, Kota and Bakornas, Satkorlaks and Satlaks. Recruitment and training of the required number of technical experts in the relevant agencies is also required.

NATIONAL ACTION: Recommend national and provincial governments to develop all hazards disaster management response plans based upon emergency support function (ESF) roles. These functional roles include coordination of transportation, communication, energy, public works and engineering, mass care and feeding, planning, debris management, etc. All National and Provincial Government organizations have specific roles to play in disasters and can be grouped within ESF functional roles. In the event of a major disaster, national and provincial disaster response plans will deliver resources to municipal government in an orderly fashion. An example of a successful national response plan is one developed by the U.S. Department of Homeland Security / Federal Emergency Management Agency (FEMA).

REQUIREMENT:

1. *Provide assistance for training of staff of Tsunami Warning Agencies to maintain and operate newly established Tsunami warning system.*
2. *Enhance national capacity on disaster management particularly at the level of local Government identified through the above mentioned capacity assessments.*
3. *Provide twinning (institution-institution cooperation and expertise exchange) and assistance to Universities to provide higher University education in the requested disciplines.*
4. *Provide training for absorption and indigenisation of new technologies for Tsunami warning which are now being provided to Indonesia through International assistance.*

Needed capacity enhancement:

1. *Long term education (degree program) to upscale the national capacity, including the capacity for the local universities;*

2. *Additional resource input to upscale the public education and preparedness program*
3. *Technology transfer for indigenization of relevant and cost effective technology and system*

c. TSUNAMI RESPONSE PROCEDURE (DISTANT OR REGIONAL TSUNAMI)

The following criteria are being considered by the designated emergency authority to determine whether an evacuation should be issued (noting that so far no warning have been issued):

1. Rapid assessment and evaluation of the advisory (while waiting for confirmation or cancellation)
2. Activate the “hubs” of the corresponding responsible agencies and organizations according to standard operating procedure
3. Check and re-check to national warning center (BMG)
4. Mobilize the people according to the evacuation plan by sectorally, temporally and spatially.

NATIONAL ACTION:

BMG should ensure that the meaning of its messages are understood by its recipients. Eg: the use of “tsunami information bulletins” and “watch and warning bulletins” should have specific actions associated with it (so: tsunami information bulletins will cause actors A,B to immediately implement actions 1 and 2; watch and warning bulletins will cause actors A,B to immediately implement actions 3, 4)). The actions may include siren sounding and immediate evacuation.

In terms of information dissemination to the public, there are no sirens; at this moment the earthquake information is broadcast by SMS (to Government officials/leaders); BMG can cut into TV and radio broadcasts for emergency messages (but no dedicated telephone line); other methods used are fax (to Government officials/leaders), internet. These are for multiple hazards, not tsunami-specific. To alert communities population can subscribe to receive SMS messages. Brochures exist that explain how to do this. [comment: network saturation risk]. Discussions are ongoing with telecom providers selective dissemination (to certain officials and contacts).

NATIONAL ACTION: Continue to develop the 24/7 capacity throughout the country to sound sirens along coastal areas, announce emergency information to the media, and communicate with the public through multiple pathways in an all hazards environment.

There are currently no emergency plans, tsunami tsunami evacuation plans and/or signage indicating evacuation routes to safety or higher ground, except those developed for the Pilot Project sites in Padang.

NATIONAL ACTION: Expand the successful Padang Pilot Project throughout Indonesia’s coastline communities.

NATIONAL ACTION: It is recommended that consistent disaster risk management plans for tsunamis that involve the national government, provincial, and district level be developed as one comprehensive tsunami response plan. These plans should consist of 1) designation of potential high risk areas, 2) establishment of evacuation places and routes, 3) framework of communication and information dissemination system, 4) response at the time of the issuance of traffic regulation, evacuation, safe shelters, warning cancellation, “all-clear”, etc., 5) education and public awareness, and 6) evacuation drills.

In terms of marine warning and guidance or instructions for marine vessels, harbors and ports, there are none specifically for tsunami but there are warnings for storm surges, issued by BMG (for boats). These warnings are sent to Port Authority and also broadcast through radio system of Department of Fisheries. No details available on transmission range. Information also sent to newspapers daily. Note that BMG has 7 marine stations.

NATIONAL ACTION: *The tsunami mariner safety message, promulgated by the United States Coast Guard states that vessels are safer in deep water of at least 200 fathoms. However no one should attempt to move their boats at anchor during a local tsunami because the waves will arrive onshore within minutes after the earthquake. Vessels that are already at sea are advised to wait until tsunami warnings are cancelled before returning to the coastlines.*

Currently the public is not required by law to evacuate but a law-making effort is underway.

NATIONAL ACTION: *It is recommended to encourage local jurisdictions implement mandatory evacuation regulations. This will allow evacuations to be executed more orderly and efficiently.*

NATIONAL ACTION: *NDMO organizations (Bakornas, Satkorlak, Satlak) should be protected in the execution of their duties with “immunity from liability” laws. This will reduce public lawsuits when false evacuation orders may lead to injuries and/or loss of economic income.*

NATIONAL ACTION: *When fully implemented, the National Tsunami Warning Centre will issue a Tsunami Cancellation Bulletin when the threat of destructive tsunami waves has diminished. Emergency responders may then commence search and rescue operations. Local authorities need to inform the public when it is safe to return. This can be done through the issuance of an “all clear” message.*

d. ISSUANCE OF WARNINGS FOR MARINE SAFETY AS COORDINATED BY THE JCOMM

No use of NAVTEX, Safety-Net etc.

NATIONAL ACTION: *Specific tsunami notification mechanisms and procedures for ports and mariners should be developed.*

Shipping bulletins are provided to Port Authority (Department of Transportation, Directorate General for Sea Transportation). They transmit by radio. They are formulated by BMG (following IMO standard)

NATIONAL ACTION: *As far as the safety of mariners and coastal zone users is concerned, it is important to use mechanisms for alerting them that are suitable for their particular needs and circumstances. For example, in the case of SOLAS vessels, the GMDSS should be encouraged. Ships should already be equipped with radio and other telecommunication devices, and satellite communication can be used to disseminate warnings. While this issue was not discussed in detail in the meeting, it is important to consider that if the SafetyNET service of INMARSAT satellite communication is considered by Indonesia to disseminate warnings to National agencies, as authorized by IMO in COMSAR/Circ. 36. Coordination of the inclusion of tsunami warnings is needed with the METAREA Issuing Service. Specific information, communication and training should also be planned for skippers and boat operators. Regular surveys could be conducted to check the knowledge of the community.*

The warning are considered as effective and timely. The weakness is the availability of only 7 marine stations (synoptic) so observations are limited.

NATIONAL ACTION: *Guidance will be needed for artisanal fishermen and other small craft operators who will not have the infrastructure referred to above. Refer also to warning national action above.*

e. DISSEMINATION PROCEDURE (LOCAL TSUNAMI)

For the case of a regional- or locally-generated tsunami, there are no procedures for responding, except for the experiment in Padang.

NATIONAL ACTION: *The tsunami response plan should be written and distributed to all relevant agencies involved in the response. It should include Standard Operating Procedures and protocols that will be followed. It should identify the actions that will take place, the organizations and individuals that will be involved and their roles and responsibilities, the means by which they will be contacted, including phone numbers and other essential emergency contact information, the timeline and urgency that will be assigned to the action, and finally the means by which ordinary citizens will be alerted to evacuate. (refer also to question 24)*

f. DISSEMINATION PROCEDURE (LOCAL EARTHQUAKES)

There for no formal response procedures for earthquakes (drafts exist, circulated internally). BAKORNAS also has procedures written down but requires updating.

NATIONAL ACTION: *Integrate earthquake (ground shaking) and tsunami response procedures into one plan. A major earthquake will cause structural damages within a community and must be addressed simultaneously with the potential for tsunami impact damage.*

g. RESPONSE PROCEDURE DRILLS/EXERCISES

Initial community based (bottom up) efforts were attempted in Aceh and Padang to establish a standard and local specific procedure and assessment is on going. Involved: Mayor, Satlak (including police, army, ambulance), NGOs, civil defense, health services, public works, water utility company, religious organizations, prominent persons. How this is done: announced through radio (there are 3 official broadcasters in the area), newspaper. Frequency: 3 times (4th time will be 1 Sep 2005)

NATIONAL ACTION: *Recommend two to three earthquake and tsunami exercises per year at the district and municipal level, and one to two exercises per year at the national and provincial level. This exercise schedule will sustain better planning and preparedness readiness levels over many years.*

The earthquake and tsunami exercises can take a number of different approaches eg at national level: a comprehensive simulation exercise (in a room) that examines the detection forecast, warning and response infrastructure; and at the local level: a field exercise (rehearsal) involving all communities, stakeholders and involving actual evacuations, search and rescue.

The exercises/simulation should be based on a well defined scenario and a performance assessment of all aspects of the exercise should be included.

NATIONAL ACTION: *Expand the successful Padang Pilot Project throughout the country.*

h. CONSIDERATION OF CRITICAL INFRASTRUCTURE

In the Indonesian Earthquake-resistant Building Code, the critical infrastructures have been given special attention by giving them higher importance factor. It means, these structures should be built at a higher level of strength than other types of structure.

Note: in the case of Padang buildings are being assessed from an structural/EQ resistance point of view (including whether they are appropriate for vertical evacuation).

New airport, bridges and mosque are being assessed.

[note: Indonesian building code is in line with universal building code UBC of 1989 (0.3 g). This will be revised after Aceh earthquake (0.35 g).]

NATIONAL ACTION: *GIS is an effective tool for mitigation. Eg: the overlaying of a GIS layer of critical infrastructures upon tsunami inundation/evacuation maps will quickly identify facilities at*

risk. Efforts should be focused on the structural survivability or relocation of critical infrastructures and lifeline support facilities

i. OTHER LOCAL CONTACTS

Sme contacts have been identified in Padang. Other additional contacts available. (list available but not to be included in this report).

NATIONAL ACTION: Compile and forward a list of reporting contacts to PTWC/JMA

j. POST TSUNAMI SCIENCE SURVEYS

Quite a number of surveys were carried out, including post tsunami survey with the ITST (International Tsunami Survey Team), in which LIPI, ITB, BPPT, USGS and Russian Institute was involved. A joint Indonesia – Norway coastal resources and environmental survey was carried out by using our R/V Baruna Jaya VIII in July – August 2005. Such surceys are usually carried out by MGA, LIPI, ESDM, Bakosurtanal (land-survey), BPPT (sea-survey using research vessel), University, DKP

NATIONAL ACTION: Because of the relatively frequency of tsunamis, Indonesia may want to consider a national plan for the immediate and efficient collection of tsunami runup and inundation data after an event.

Section 5. TSUNAMI HAZARD AND RISKS

a. TSUNAMI HAZARD STUDIES

Studies have been done to document the tsunami hazard in your country or region (either before or after 26 December 2004. A good historical record exists of past earthquakes and tsunamis.

NATIONAL ACTION: It is recommend that Indonesia shares it extensive experience in building historical records of earthquakes and tsunamis with other countries in the region. This could be accomplished through exchange programmes.

b. TSUNAMI VULNERABILITY STUDIES

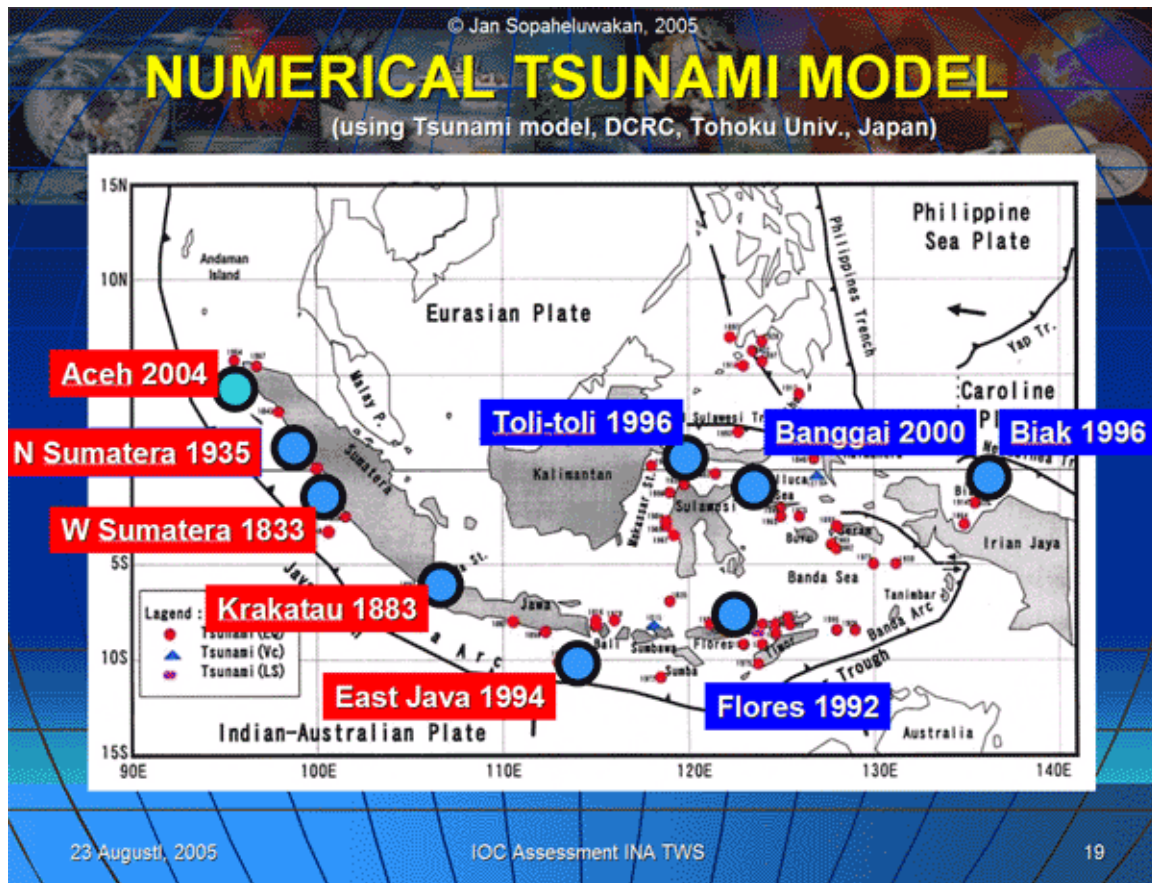
Studies have been done to identify vulnerabilities and then to document the tsunami risk in Indonesia: e.g. in Flores which was hit by the 1992 tsunami, Banyuwangi in 1994, and Aceh/Nias in 2004/2005, Biak in 1996. Example: Tsunami Hazard and Its Effects on Indonesia Coastal Region (BPPT-JICA, 2001- March 2004) –

c. NUMERICAL MODELING STUDIES

Numerical modeling studies been done to calculate inundation from tsunamis in your country for some areas. Modeling has been done for 10 locations in the country (see slides in the LIPI presentation). More detailed and improvement are carried out for the city of Padang.

Examples:

- Tsunami Hazard and Its Effects on Indonesia Coastal Region (BPPT-JICA, 2001- March 2004)
- See figure below



Inundation modelling will be done through expansion program for the nation-wide coverage of the modeling program.

Technical training is required to improve the existing capabilities and, just in case, to see if there is any updated version exist. We would rather say that the program is better called as exchange program than training for us. Our scientists are able to share and conduct training for our own purpose as well as for the neighbouring countries. This practice has been going on through trainings organized by Thailand recently that involved many of Indonesian scientists as trainers quite a lot. Our scientists are ready to train participants in the IOC run training program.

Bathymetry and topography data do not exist for the coastlines and will need to be collected first.

NATIONAL ACTION: *Updated topographic and bathymetric need to be collected to update and complete existing data sets. Indonesia should establish a programme of bathymetric and topographic data collection that includes identification of the highest priority areas for hazard and vulnerability identification and analysis.*

d. GIS USE

GIS is used, as part of the national database program carried out by the Bandung Tsunami Group involving primarily ITB and LIPI. The general GIS expertise is with universities. The application of GIS to earthquake and tsunami is with Bakosurtanal and LAPAN.

NATIONAL ACTION: *It is recommend that Indonesia shares its experience GIS with other countries in the region. This could be accomplished through exchange programmes.*

f. POST-TSUNAMI SURVEYS

Post-tsunami impact assessments have been conducted. (see also above). Others include cooperation with Caltech (California Institute of Technology), JAMSTEC (Japan's R/V), British Geological Survey (HMS Scott), IPG France (R/V Marion Dufresne), Oregon University, Hokkaido University, Kyoto University, Tohoku University, Red Cross, AUSAID, and numerous others (many were presented in the recent Padang Conference in August 24 – 28, 2005. Complete list are available on request).

Data collected include:: structural and non-structural physically damage, run-up and inundation, vertical and horizontal displacement, (marine and terrestrial) geological and geophysical, and oceanographic tsunami signatures, emergency response, public perceptions of hazard and response. There is also the damage assessment report prepared by BAPPENAS (available from their web site).

Section 6: TSUNAMI PUBLIC AWARENESS AND PREPAREDNESS, AND COMMUNITY LEVEL ACTIVITIES:

a. ASSESSMENT OF LOCAL GOVERNMENT PREPAREDNESS AND EMERGENCY RESPONSE

For the case of Padang and Banda Aceh local government disaster preparedness and emergency response have been assessed..

Community center meetings, drills (e.g. in Aceh and Padang) will ensure that *the information given to ordinary citizens during a warning is understood and then acted upon in an appropriate and timely manner*. Train the trainers activities will also be planned. Red Cross will also implement activities (community education, brochures,...)

NATIONAL ACTION: Many pilot projects such as meetings, seminars, workshops, etc. in Banda Aceh and Padang are started in cooperation with national/local government, local NGOs, Red Cross and international organizations. Replication of the programs in pilot areas to other areas is needed.

b. ASSESSMENT OF COMMUNITY PREPAREDNESS AND EMERGENCY RESPONSE

The population are aware of what is a tsunami. It is unclear whether they know how to respond (at national level). At the local level in Padang they know now. In Simeulue Island there is traditional knowledge about tsunamis so they know how to respond (casualties were minimal after 26/12 tsunami). In Padang and Aceh community-level education and preparedness programmes for national hazards or tsunamis are underway. These are implemented by various organizations (governmental and NGO)

Awareness was achieved through quite a variety of media: trainings, brochures, stickers, books, comics, TV Talkshows, radio broadcastings, continuous articles and news in various national and local newspapers, community drills in public and schools, games and simulations.

People based, bottom up outreach programs have been carried out, conducted by LIPI, BAKORNAS, Local governments, local NGOs, Red Cross, AUSAID.

NATIONAL ACTION: Many pilot projects such as developing evacuation maps, posters, evacuation routes, sign posts, drills, seminars, workshops, etc. in Banda Aceh and Padang are started in cooperation with national/local government, local NGOs, Red Cross and international organizations. Replication of the programs in pilot areas to other areas is needed.

It is planned to replicate the program in pilot areas to other areas through ToT (training of trainers) Programs.

NATIONAL ACTION: A training of trainers (ToT) approach could be applied to ensure awareness and preparedness at the smallest local level, specifically in remote islands and other areas.

c. COMMUNITY PARTICIPATION

Local authorities engage in community-level, citizen-based, stakeholder participation in developing and deciding risk avoidance and mitigation activities.

Community-based, risk based decision making is used. Improvements are being made. Red Cross is doing Participatory Rapid Assessment (PRA) of community knowledge.

The Red Cross is undertaking some assessment at the local level (in Aceh province).

NATIONAL ACTION: It is recommended to carry out community risk assessments with consideration of the utilization of scientific knowledge and traditional knowledge and active community participation in the process.

NATIONAL ACTION: It is recommended to annually hold a “National Disaster Preparedness Day”, possibly on 26 December. It should be organized in close cooperation with the media.

PEOPLE-CENTERED EARLY WARNING MECHANISMS

Non-government, people-centred, community-based organizations, such as the local Red Cross/Red Crescent Society, play a role in the receipt and delivery of tsunami or multi-hazard early warnings to people at the local level. In Padang, local NGO (e.g. KOGAMI – Komunitas Siaga Tsunami = Tsunami Prepared Community) is assessing the current and past capabilities and working with local authorities and government to improve the delivery of warnings. Unlike in Bangladesh and Iran, there is no formal, legally mandated role for Red Cross/Red Crescent Society to deliver warnings to the public at large

PEOPLE-CENTERED PREPAREDNESS MECHANISMS

Non-government, people-centered, community-based organizations, such as the local Red Cross/Red Crescent Society, play a role in the early warning preparedness and community outreach and education to people at the local level. Padang: KOGAMI produces education materials, evacuation maps, SOPs, training activities, community drills, awareness through radio broadcasting and TV Program and door to door campaign, cartoons, in mosques also, network with Radio Communication Organisation (ORARI), participate in national and international seminars/meetings.

d. EDUCATIONAL MODULES OF THE TSUNAMI NATIONAL FOCAL POINTS \

As the designated national tsunami focal point there are plans to have a Tsunami Education and Public Outreach Programme. This is included in the draft grand scenario of Indonesian TEWS in 2005 the program will be implemented in 2 locations.

Other hazards such as earthquake, volcanoes, landslides have already their own SOP. Integration will be done in the future.

Educational materials are distributed through direct contact with the local community, local government. Upscaling and duplication of the materials will be done upon additional support from the governments and donations/supports from domestic and international organizations.

Training for the media on tsunami hazards, mitigation, warning, and preparedness has been done while giving press release and conferences. More systematic program will be done in the future.

NATIONAL ACTION: The media training programme should also be enhanced, eg through routine press conferences and other media interaction (interviews, special reports etc).

The availability of educational modules and training sessions customized to particular culture/infrastructure would be helpful. Indonesia is ready to customize it in cooperation with donors and international organizations.

Interaction with stakeholders is organized through Seminars, consultation meetings, informal meetings, exchange of information, mailing list. We would benefit from assistance/guidance/on-going contact with our national and regional partners through seminars and workshops.

REQUIREMENT: Indonesia would benefit from regional training activities strengthening the linkages of key organizations involved in the Early Warning Process (Technical agencies, Media, Risk Managers, etc.)

d. EDUCATIONAL CURRICULUM

Earthquake and tsunami hazards and preparedness are currently NOT part of the educational curricula taught to school children. Soon it will be incorporated in the curricula in Padang.

NATIONAL ACTIONS: To include disaster preparedness into curricula (for each hazard including tsunami).

e. OTHER OUTREACH PROGRAMMES

There are some other funded programmes which have provided outreach. Some initial successes have been recorded through COREMAP Program (coral reef mapping, ADB funded). More massive and extension to tsunami oriented outreach program is needed. Small cooperation has been conducted with Red Cross and AUSAID. More massive program is welcome.

Examples: Reproduction and expansion to national level of the master products we have developed in pilot projects (eg Padang) (brochures, guidebook, pocket book, stickers, video program, TV Spot, Radio spot, dedicated articles in the news), Training of the Trainers, briefings.

NATIONAL ACTION: programmes should ensure that the local citizens (including those in affected areas – and those in temporary shelters after the 26 December tsunami) are made fully aware about tsunamis, the national (and its local elements) tsunami warning and mitigation system and its operation.

f. TSUNAMI MEMORIALS AND MUSEUMS

Currently there are no tsunami memorials, museums, interpretative signage or other public reminders of past tsunami impacts. There are plans, in the form of memorials in Banda Aceh and Earthquake / tsunami museums in Jakarta.

ACTION REQUIRED: Technical support and sharing of expertise by other countries who have established such “reminders” is requested (eg Hawaii, Japan, Chile).

g. STRUCTURAL MITIGATION EFFORTS

Earthquake-resistant building and pemukiman akrab bencana banjir (flood-friendly residence) (elevated housing) have been implemented.

h. NON-STRUCTURAL MITIGATION INCLUDING LAND USE

Some affected areas have been allocated for mangrove and land-use maps for 15 provinces (for Banda Aceh town: land use plan has been made with focus on evacuation and new construction zoning)

i. EVACUATION ISSUES

Tsunami evacuation maps, evacuation routes, and evacuation signage have been developed Padang. For Banda Aceh also, in a less developed way. NGOs and private sector stakeholders are providing guidance. However coordination with local government authorities needs to be increased.

NATIONAL ACTIONS: It is recommended to have ToT (Training of Trainers) with special emphasis on coordination with local authorities.

REQUIREMENT: training is required

j. INTERNATIONAL COOPERATION FOR AWARENESS

Cooperation exists with United Nations (UNESCO, UNDP, OCHA, UNICEF), Red Cross, JICA and DIPECHO provide funding for disaster-related research activities

k. INTERNATIONAL COOPERATION FOR STRUCTURAL AND NON-STRUCTURAL MITIGATION

Cooperation exists with World Bank, ADB and JICA among others provide assistance for rebuilding tsunami destroyed infrastructure with seismic and tsunami safety standards.

Section 7: TSUNAMI RESPONSE TO 28 MARCH 2005 M8.5 EARTHQUAKE OFF SUMATRA, INDONESIA

a. PREPAREDNESS

When earthquakes were felt by people in the coastal region, the community prepared themselves to evacuate to higher ground. It reflects that a higher awareness and preparedness have been developed in the community.

People responded appropriately: people ran to higher ground without instruction from authorities, upon feeling the shaking; SMS messaging and cell phone were efficient means for communication from the source area to the rest of the country, including BMG). Also radio stations quickly reported the earthquake (after having received phone call from the source area.

b. *ADVISORY*

Indonesia received an international tsunami advisory message from the PTWC or JMA. It was received in less than 20 minutes.

c. MONITORING SYSTEMS

Indonesia had a national monitoring systems in place that detected and evaluated the earthquake. It took more than 30 minutes (due to the need to manually process and locate the earthquake)

d. NATIONAL RESPONSE PLAN

Indonesia did not have a national tsunami response plan in place. However BMG called BAKORNAS and sent faxes to various Government Agencies and media.

NATIONAL ACTION:

- 1. It is recommended to undertake a study to determine how much time is minimally required to ensure a complete evacuation out of the inundation zone to a safe zone for the most vulnerable (or highly-populated) community. This is a critical point to design an effective tsunami warning system. Evacuation plans should take into account the safe evacuation of persons with physical handicaps or other groups needing additional assistance, and the time of day of the evacuation order. It is recommended that a test be conducted to see how long it currently takes for the warning message to reach people on the coast, including the remote communities.*
- 2. Evacuation guidelines should also be part of the public education programme.*

Section 8: OVERALL ENHANCEMENT OF YOUR NATIONAL CAPABILITIES TO MITIGATE THE IMPACT OF HAZARDS (WMO)

In terms of addressing the establishment of the Tsunami Early Warning capabilities within a multi-hazard framework, this is not fully considered. BMG will take responsibility for earthquakes, climate, extreme weather and tsunamis; Ministry of Public Works for Floods; Ministry of Energy and Mineral Resources for Landslides and Volcanic Eruptions; Ministry of Forestry for Forest Fires.

It was admitted that tsunami has made great changes in the way we should manage the disaster. The lesson learned from the disaster has improved dissemination of information and has increased the awareness and preparedness of all components in the country for disaster. Before the tsunami, such knowledge was there and tsunami underlined the importance of disaster management understanding.

The massive loss of life and property has given strong impetus to natural disaster management and has caused a re-evaluation of existing response mechanisms as well as promoted the development of additional mechanisms for all hazards.

e. OTHER CRITICAL AREAS

NATIONAL ACTION: Use the impetus provided by the recent tsunami to fully integrate all warnings for other hazards into the multi hazard framework. The development of formal authorities and chains of command, standard operating procedures, lines of communication, public education and outreach that are required for effective tsunami warnings should be applied to all agencies. For example, the flood warnings should be more closely aligned (warnings currently done with separate agency). The tropical cyclone warning and advisory service for the Indonesian area of responsibility, which is to be trialed this year, should be fully embedded into the existing disaster management framework.

7. NATIONAL PROPOSAL

In preparation for the Mauritius Coordination Meeting countries were invited to submit draft proposals. These were included in Document IOTWS-II/5rev. Within the short time available for the mission it was not possible to review the proposal. The experts have been requested to provide comments on the current proposal. These comments may be used by the National Tsunami Coordination Committee, when established, to revise the proposal.

NATIONAL PROPOSAL

INDIAN OCEAN TSUNAMI WARNING SYSTEM

This document was prepared for the Coordination Meeting (Mauritius, 14-16 April 2005) and is included in this report for information,

Project Title : Establishment of Tsunami Early Warning System in Indonesia

Implementing Organization: Meteorological and Geophysical Agency of Indonesia

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Beneficiaries : Local Governments

People living and tourists in coastal areas
Industries, hotels, restaurants and other business in coastal areas
People in the surrounding Indian Ocean Basin

Partners : **National Partners**

Ministry of Research and Technology
National Coordinating Agency for Mapping and Survey
Indonesian Institute for Sciences
National Agency for Assessment and Application Technology
National Coordinating Board for Disaster and Internally Displaced People
Bandung Institute of Technology

Overseas Partners

Intergovernmental Oceanographic Commission (IOC) UNESCO
Comprehensive Nuclear Test ban Treaty Organization (CTBTO)
National Research Institute of Earthquake and Disaster
Prevention (NIED), Japan
China Earthquake Administration (CEA)
Ministry of Education and Research of Germany
Japan Meteorological Agency (JMA)
World Meteorological Organization (WMO)
Delft Hydraulic and KNMI of the Netherland

Aim :

To establish one National and ten Indonesian Regional Earthquake Information and Tsunami Warning Centers.

Install and upgrade 160 seismic station, 500 accelerograph, DART system, GPS buoys, network of GPS and network of Tide Gauges.

Set up automatic integration system

Set up automatic data acquisition, phase picking and processing

Set up Data base system

Set Up telecommunications system for data collection and warning dissemination

Support pledged

- China through CEA will provide ten seismograph broadband and accelerometers, processing facilities, training, expertise, maintenance for limited time. The Intention of Cooperation is already signed in early March 2005. MoU will be signed in early April 2005.
- Germany through Ministry of Federal Education and Research will support on the first phase: up to 25 seismograph and accelerometers, 10 GPS, 10 GPS-buoys, 20 DART, capacity building. Joint Declaration has been signed on mid of March
- Japan through NIED will support up to 44 seismometers, of which 20 has been operated and the rest will be installed within the near future.
- The Netherlands, through Delft Hydraulic will be supporting softwares for tsunami simulation. Memorandum of Cooperation has been signed in February 2005

Support sought

In kind support are requested to complement the existing installed and the soon-to-be installed equipments and facilities already and covered by donor countries like Japan, Germany, China, Netherlands. We would seek further contribution from the following countries/organizations are welcome :

- Japan
- USA
- France
- Australia
- Unesco

Total Cost

The system is estimated to cost US \$ 59,800,000.

1. Overview

Indonesia is located in very seismic active region, this can be referred to the historical record from 1900 up to 2004 that 212 earthquakes with magnitude greater and equal 7.0 RS had occurred at which 183 located in the sea and 153 were shallow. According to Gusiakov data base, there were 86 tsunami generated. On the ASEAN regional basis, earthquake with magnitude greater than 6.0 on Richter Scale 46 % located in Indonesia. With regards to Indian Ocean, most

of major earthquake take place in Indonesia along more than 4000 km long of subduction zone which begins from north Sumatra to east of Timor island.

The distance of the earthquakes source to shore lines varies from few tenth of kilometers to around 300 km, this will correspond to few minutes to 30 minutes of arrival of tsunami waves. In this regards, the tsunami warning should be disseminated much earlier which will need earthquake location and magnitude and depth should be found before 5 minutes. In order to locate the earthquake source in less than 5 minutes MGA proposes to set up 10 Indonesian Regional Centers and one National Center. When one of the Indonesian regional Center issue the warning for local tsunami, National Center will verify and decide to transmit the warning to national level and regional scale event global scale.

The system will base on earthquake monitoring system and strongly supported by DART, tide gauges, GPS at which the data will be collected and processed at the respective Center.

2. Workplan

2.1. Establishment of Tsunami Warning System

2.1.1. Establishment of Earthquake Monitoring System

- seismograph : 160
- accelerograph : 500

2.1.2. Establishment of Sea surface monitoring

- tide gauges : 50
- DART : 10

2.1.3. Establishment of GPS stations

- Permanent GPS
- Temporary GPS

2.1.4. Establishment of Indonesia Regional Center

- Upgrade Indo-Regional Centers : 5
- Establish new Regional Center : 5
- Upgrade National Center : 1
- Set up automatic signal integration system
- Set up automatic data acquisition, phase picking and processing
- Set up data base for historical earthquake-tsunami and simulated of tsunami wave arrival time and height at selected coastal area at each Center

2.1.5. Establishment of Telecommunications for data collections

- real times for seismograph network
- real time for accelerograph collocated with seismograph
- near real time for accelerograph network
- real time and near real time for DART
- real time and near real time for GPS buoys
- real time and near real time for Tide gauge network
- real time and near real time for GPS

2.2. Establishment of Alert dissemination and mitigation (not included in the cost proposal)

2.2.1. Establishment of Telecommunications system for Alert dissemination

- telecommunications to local authorities
- telecommunications to Police offices
- telecommunications to mass media
- infrastructure for alerting the coastal people

2.2.2. Construction of shelter and people protection

- construction of shelter
- construction of safety path to shelter

2.2.3. Public education

- public education
- socialization
- monument construction

- 2.3. Management and oversight (not included in the cost proposal)
- Management and oversight
 - Overhead

3. Supporting Material

- Map of seismographic network
- Map of accelerographic network
- Map of Tide gauges and GPS
- List of proposed seismograph stations

ANNEX I

LIST OF PARTICIPANTS

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ANNEX II

COUNTRY ASSESSMENT QUESTIONNAIRE ON TSUNAMI WARNING AND MITIGATION ACTIVITIES

SECTION 1: CONTACT INFORMATION (NAME, ADDRESS, PHONE, FAX, E-MAIL)

Question 1: Please identify or confirm the national points-of-contact who we can work with for tsunami mitigation activities in your country. Mitigation activities include tsunami warning and emergency response and preparedness, and education and outreach. Typical agencies involved in these activities are the national emergency response agency, meteorological services, and universities or other technical agencies operating seismic and/or sea level networks or conducting numerical modelling or other engineering studies.

Answer: The following national points-of-contact can be grouped according to the competency of the institution, e.g.:

Technical work:	BMG	Mr. Prih
Capacity Building:	RISTEK	Mr. Idwan
Dissemination	BMG	Mr. Prih
	Kominfo	Mrs. Agnes
	BAKORNAS	Mr. Sugeng
Emergency response and preparedness (subject to final approval of Draft Law)	BAKORNAS	Mr. Sugeng

SECTION 2: AUTHORITY AND COORDINATION

Scope: Please outline your country's situation regarding authority and coordination. Below are some questions that should be considered in providing a description.

2A: LEGAL FRAMEWORK

Question 2: Does your country have laws which designate specific government agencies to provide science-based warnings to specific government agencies, disseminate public warnings instructing the public to take or prepare to take actions, and to provide appropriate emergency response after a destructive tsunami to the affected communities? Please briefly describe these, listing the laws or administrative rules or similar legislation, the agencies designated, and their roles and responsibilities.

Answer: Not yet. A law on "national disaster management" is still being discussed between the Government and the House of Representatives.

- BMG has been designated to provide warnings (for earthquakes and tsunami, extreme weather, climate as well as air quality)
- Bakornas has been designated for disaster management and emergency response (for all hazards, not tsunami specific) including preparedness.

The Disaster Management Bill is under consultation between the government and the Parliament. Two public hearings were conducted, the first was on August 24, 2005 and the second was August 29, 2005. LIPI has proposed 3 new Articles on the Early Warning System and Preparedness, while other aspects related to it has also been proposed to be taken as basic principles and important dimensions which should not be overlooked, such as the public participation, private – public partnership, the international collaboration, the multi-hazards approach, the continuous monitoring, national and local council on disaster management, educational aspect, financial and industrial aspects, incentive system, and many other issues. For the time being, the Vice President has appointed the following responsible institutions: Early Warning System (Meteorology and Geophysics Agency – BMG), Public Education and Preparedness (Indonesian Institute of Sciences – LIPI), Dissemination and ICT (Department of

Communication and Information – KOMINFO), Emergency Response (National Coordinating Agency for Disaster Response and Displaced People – BAKORNAS).

2B: NATIONAL PLATFORM FOR DISASTER REDUCTION

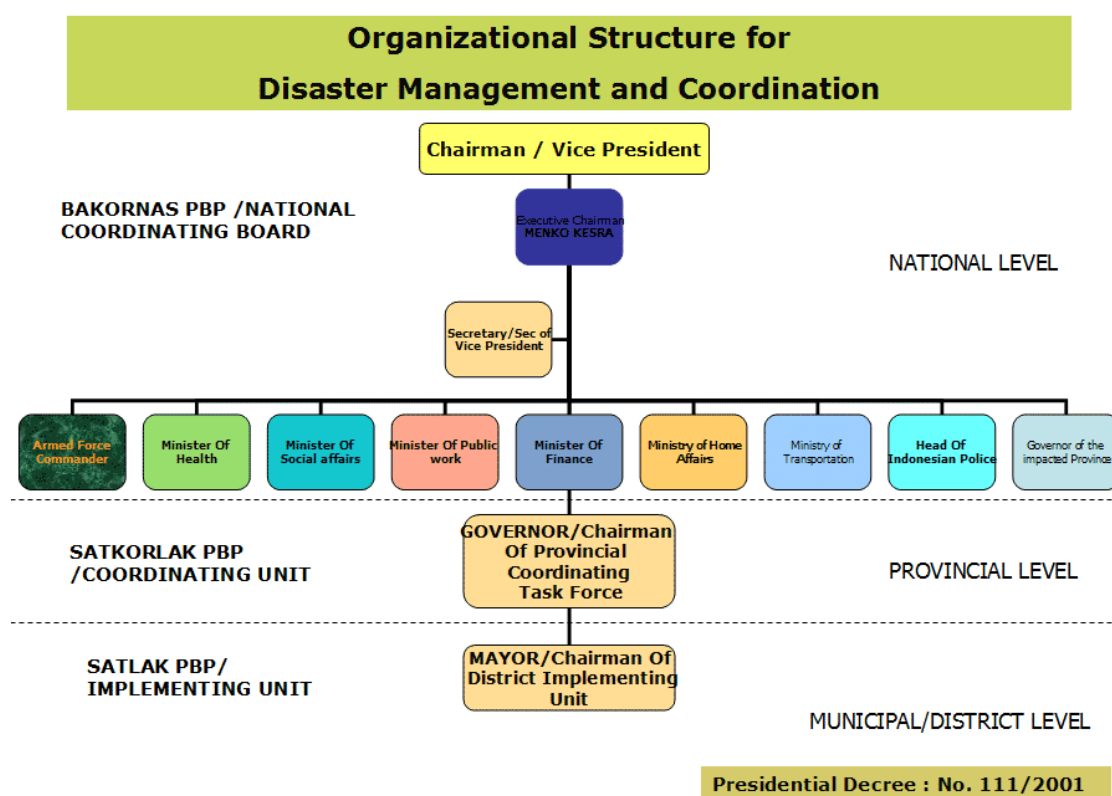
Question 3: Does your country have a National Platform or other mechanism for guiding disaster risk reduction in general?

Answer: YES, WE HAVE. There is national guideline/manual (but is out of date). Last version was 1997. This should be updated in the future.

Question 4: With respect to tsunamis, for example, has your country established a National Tsunami Warning and Mitigation Coordination Committee or some other coordination mechanism?

Answer: An “informal” group has been created and has met several times. However this Group has not yet been “formalized” as a National Tsunami Warning and Mitigation Coordination Committee. It is expected that this will be included in the Ministerial Decree that is being discussed (see Question 2). The Group has developed a “Grand Scenario of Indonesian Tsunami Early Warning System” and will continue to meet.

The below figure shows the expected organizational structure for disaster management and coordination:



Question 5: Does your country have similar coordination mechanisms at the community level?

Answer: Yes. Represented by the Satkorlak at the Provincial level and Satlak at the Kabupaten (District/County) or Municipality level. These are under BAKORNAS. In the case of Padang City in West Sumatra, the Municipal Government has restructured recently a specialized service unit directly under the Mayor, called the Social Welfare and Disaster Management Service (formerly was Social Welfare and Fire Disaster Service).

Question 6: Who (types of persons and agencies) are members of this Committee?

Answer: The Chairman of this committee normally is the appropriate Army Commander at the respective level. He reports directly to the Governor or the District/County Head or the Mayor. The members consist of representative of the relevant sectors, such as the Police, Public Works, Health Service, Social Welfare, Civil Defense, Local Logistics Service, Water Supply Company, Electricity Company, Telecommunication Company, etc.

Question 7: *What authority does this Committee have (decision-making, policy-making, advisory (if yes, to whom), independent reporting to one agency, etc.)?*

Answer: Bakornas has 3 tasks:

- Policy formulation
 - Coordination of implementation
 - Provide guidelines and directives

As such it has decision-making and policy-making authority. At the provincial and local levels Satkorlak and Satlak implement the decisions of Bakornas.

2C: NATIONAL ORGANIZATIONS

Question 8: *What are the important organizations, both government and non-government, for the implementation of a tsunami early warning and mitigation system?*

Answer: See Question 1.

BAKORNAS PBP: is a national coordinating board for disaster management, chaired by the Vice-President

SATKORLAK PBP: is provincial coordinating unit for disaster management, chaired by Governor in the respective area;

SATLAK PBP: is a district or municipal implementation unit for disaster management, chaired by Bupati or Mayor of the city.

Elements Institutions	Warning guidance and dissemination	Public awareness	Preparedness	Rapid response
BAKORNAS		√	√	√
BAKOSURTANAL	√		√	
BASARNAS				√
BMG	√			
BPPT	√		√	
DIKNAS		√		
DKP			√	
ITB		√	√	
KRT		√		
KOMINFO	√			√
LAPAN			√	
LIPI		√	√	
Media	√	√	√	√
NGOs		√	√	√
PEMDA		√	√	√
SATLAK				√

Question 9: *What roles will they play? Please specifically include the roles, responsibilities and authorities of the National Meteorological Service and the National Disaster Management Organization, or their equivalent monitoring, warning evaluation, and warning dissemination agencies. These, in fact, may be the same as those that comprise your Coordination Committee above.*

Answer: The activities involved can be seen in the following table.

- Emergency response: BAKORNAS (<http://www.bakornasbp.go.id>) and IFRC/PMI (<http://www.palangmerah.org>) and BASARNAS (<http://www.basarnas.go.id>) and Ministry of Health (<http://www.depkes.go.id>)
 - Meteorological services: BMG (<http://www.bmg.go.id>) and LAPAN (<http://www.lapan.go.id>)
 - Community preparedness: LIPI (<http://www.lipi.go.id>) and Depdagri (<http://www.depdagri.go.id>) and IFRC/PMI (<http://www.palangmerah.org>)
 - Capacity building: Ristek (<http://www.ristek.go.id>)
 - Tsunami modeling: ITB (<http://www.itb.ac.id>) and BPPT (<http://www.bppt.go.id>) and BMG (<http://www.bmg.go.id>)
 - Sea-level monitoring: BPPT (<http://www.bppt.go.id>) and Bakosurtanal (<http://www.bakosurtanal.go.id>)
 - Deformation monitoring: Bakosurtanal (<http://www.bakosurtanal.go.id>)
 - Survey vessel: BPPT (<http://www.bppt.go.id>) and LIPI (<http://www.lipi.go.id>)
 - Dissemination of information: Kominfo (<http://www.depkominfo.go.id>) and IFRC/PMI (<http://www.palangmerah.org>)
 - Institutional Development: Ristek (<http://www.ristek.go.id>) and BMG (<http://www.bmg.go.id>)
- (note: discussions are ongoing as to whether institutional development requires a separate activity or can be incorporated in capacity building)

	Activities	Agencies
1	Earthquake monitoring	BMG, Dep. ESDM
2	Sea Level Monitoring	BPPT, BAKOSURTANAL, DKP
3	Database and Tsunami Simulation	BPPT, ITB, UGM, BMG
4	Deformation Monitoring	BAKOSURTANAL, LIPI
5	Survey vessel	BPPT, LIPI, DKP
6	Dissemination of information	Dep. Kominfo, KNRT, BPPT, LAPAN
7	Development of Institution	RISTEK, BMG
8	Capacity building	RISTEK, BAPPENAS, KLH
9	Community Preparedness	Depdagri, LIPI, Bakornas PBP

2D: PRIORITIES

Question 10: *What are your priorities for implementation of an effective tsunami warning and mitigation system? For example, by topic and sub-topic (assessment, warning, emergency response/preparedness/awareness, public/government or technical capacity-building, etc), by level (national, province, community, individual), by urgency (urgent, short-term, long-term, and time frame for action).*

Answer: Because the nature of tsunami in Indonesia is of both local and regional type, strengthening community preparedness and increasing public awareness along with dissemination of warnings are considered to be the top priorities for Indonesia in the establishment of tsunami early warning systems.

We have selected Padang City as our first priority, by implementing end-to-end system and involving the whole institutions (central and local government), international organizations and donor countries, local NGOs, public and schools, the scout. Padang will be our first Pilot Project. The success and lessons learned from this City will be replicated and upscaled to another threatened coastal cities in the country and shared with the neighbouring and other countries in the world.

Question 11: *What major activities are currently taking place to address these priorities?*

Answer:

1. RISK MITIGATION STRATEGY

- Improving Urban Development Processes: This strategy is directed toward improvement of the safety of the built environment by controlling the process of urban development at the macro and micro level. This will be dealt with by public works department [will need to be member of NTCC];
- Strengthening of Emergency Management Institutions: The strategy is focused at improving the legal and institutional framework of the disaster management unit;
- Raising Public Awareness: Raising public awareness is achieved through various public campaign activities for disseminating information and through public education program and training.
- This will be realized as follows:
- IMPROVING URBAN DEVELOPMENT PROCESSES
- Review of Spatial Plan with regard to seismic safety
- Review of Local Building Regulation
- Development and implementation of Building Monitoring System
- STRENGTHENING OF EMERGENCY MANAGEMENT INSTITUTIONS
- Improvement and socialization of Disaster Management (DM) Standard Operating Procedure (SOP) and Establishment of Local Emergency Operation Center
- Preparation of City Emergency Response Plan for Earthquake
- Analysis and development of National Policy for Urban Disaster Mitigation
- RAISING PUBLIC AWARENESS
- Preparation and development of guidelines and information of mitigation measures
- Disaster public awareness campaign by educational broadcast
- Public Education campaign for Earthquake Hazard Awareness

2. TRAINING ACTIVITY

- Disaster Journalist training
- Building monitoring system training
- Training for trainer on Earthquake School Preparedness Program
- Training for management of the coastal and sea tourism areas

2E: INTERNATIONAL STANDARDS ASSISTANCE

Question 12: *Do you require assistance to harmonize existing standards and protocols in data collection, evaluation, and warning communication with those utilized by the global system to ensure interoperability?*

Answer: Yes

2F: REGIONAL COOPERATION – EARLY WARNING

Question 13: *Does your country currently cooperate with any neighbouring country when evaluating earthquakes and monitoring tsunamis in real time, or for tsunami warning services, or other mitigation activities? If yes, please describe recent activities and the nature of the cooperation.*

Answer: Yes. Among ASEAN countries, BMG is the home for the Asean Earthquake Information Center (AEIC), which relays tsunami information from JMA and PTWC to ASEAN countries. Under the ASEAN Committee on Science and Technology (COST), the sub-committee on Meteorology and Geophysics has plans for the exchange of seismic wave forms. In mitigation issues, universities in Indonesia obtain funds from various international organizations to carry out research and activities in urban disaster management (please also see Question 11). Note that Indonesia has agreement with Malaysia to exchange data for 5 stations. Within the ASEAN activity, we have had two workshops to discuss about data exchange and warning/information exchange. The dry-run of tsunami warning on 29 of July has given quite a promising results (see picture below)

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29 JULI 2005 03:00 UTC

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Program Activities	Institutions													Output
	KRT	LPND					DIKNAS	ITB	BAKORNAS/ SATKORLAK/ SATLAK	DEPSOS	PMI	KOM INFO	DEPDAGRI/ PEMDA	
		LIPi	LAP AN	BMG	BAKO	BPPT								
Early Warning														
Warning issuance														Reliable warning as quick as possible, released by the authorized institution
Public awareness														
Public campaign and education														Change in attitude towards “living peacefully” with hazards and the ability to accept further change towards preparedness
TOT														Knowledgeable and improved skill on disaster risk and mitigation, preparedness to react properly to true as well as false alarm, disseminate the skill and knowledge
Vulnerable groups training														Improved skill and knowledge to avoid and reduce the risks
Hazards assessment														
Bathymetry mapping														Bathymetry maps on operational scale for appropriate modeling purpose
Topography and land cover														Detailed topographical maps and types of land cover, infrastructures and related information
Inundation maps														Detailed and operational inundation maps, based on modeling, with information on depth of inundation and estimated tsunami current speed
Vulnerability assessment														
Social-economic and environmental baseline														GIS-based social-economic and environmental profiles and statistics of vulnerable areas, infrastructures and population at risk
Risk assessment														GIS-based detailed delineation of areas, magnitude, rate and types of risks and arrival time of disaster which may strike particular areas, population, and sectors

Program Activities	Institutions												Output	
	KRT	LPND					DIKNAS	ITB	BAKORNAS/ SATKORLAK/ SATLAK	DEPSOS	PMI	KOM INFO		DEPDAGRI/ PEMDA
		LIP1	LAPAN	BMG	BAKO	BPPT								
Damage assessment														GIS-based damage and loss estimate (death toll, loss of property, environmental damage) and estimated value of the possible total loss
Evacuation maps														
City scale														1:25.000 or greater scale map of city evacuation map showing major evacuation route, possible isolation due to earthquake shake, congestion, major pool of shelter areas, horizontal and vertical evacuation route/sites, and other relevant emergency infrastructures
District scale														1:10.000 or grater scale map of district/kecamatan scale, being part of the integrated city scale with detailed information on emergency and relevant signs of escape route
Village scale														1:5000 or greater scale map of village/kelurahan scale, being part of the integrated city scale with detailed information on emergency and relevant signs of escape route
Contingency plan														
SOP														Detailed standard operating procedure, derived from the previous related information, scenarios and possibilities as well as the possible risks and damage, addressing the “dos” and “don’ts” of the emergency managers, population (from family to the crowds scales) in any particular endanger areas, particular time and particular economic sectors
Rapid response														
Emergency planning														Conversion of SOP to emergency plan which must be understood, practiced and mastered by the emergency managers, every single person, family member, population, economic sectors as well as the vulnerable groups
Drilling and simulation														Mastery in the practices when emergency happen at any time and place, and the ability to disseminate the skill and knowledge

2G: REGIONAL COOPERATION – ASSESSMENT AND MITIGATION

Question 14: *Does your country participate in any regional partnerships for assessing and responding afterward to earthquake and/or tsunami disasters? If yes, please describe.*

Answer: YES, please refer to Question 13 above.

2H: RESEARCH EXPERTISE

Question 15: *Does your country have active researchers in seismology or tsunamis? If yes, please describe recent activities.*

Answer: : Yes. The current activities include:

- Tsunami modeling
- Decision Support Systems for early warning
- Micro-zonation
- Spatial planning
- Evacuation mapping
- Up-grading buoys and tide gauges
- Seismotectonic
- Seismic tomography
- Earthquake engineering
- Instrumentation development

We have been very active in doing research in seismology and tsunami research. Our research on (paleo)seismology and tsunami in Sumatra and other parts of the country have been referred by the international scientific community and been used further to design the tsunami warning system in the Indian Ocean. Our presentations in the Beijing, Phuket, Paris, Mauritius and Paris Meetings illustrated how our contributions have been for the establishment of the IOTWS. Indonesia is also an active member in the ITSU Pacific Tsunami Warning System. We have recently jointly organized (with JSPS, and Caltech) a quite successful International Meeting on Sumatran Earthquake Challenge (materials available on request) in August 24 – 28, 2005. The meeting was attended by outstanding scientists from the US, Japan, France, UK, India, Germany, and Indonesia. The meeting resulted in a declaration/recommendation (summarized in the presentation given to the Team Leader). Full text available on request.

Question 16: *Does your government have a government-sponsored research organization that can provide products or services to strengthen your tsunami warning and mitigation system?*

Answer: Yes. Please refer to Question 9 and 15. Too numerous to be mentioned. Among others are BMG (seismology, produces earthquake information), National Coordinating Agency for Survey and Mapping – BAKOSURTANAL (maps, tidal data, GPS, geodetic network, remote sensing), LIPI (research on (paleo)seismology, tsunami, other earthquake related prediction research, marine geology and geophysics, physical oceanography, remote sensing products, public awareness and preparedness, GPS, etc.), Agency for Technology Assessment and Application – BPPT (marine geology and geophysics, remote sensing, physical oceanography, tsunami modeling), Bandung Institute of Technology – ITB (seismology, tsunami modeling and database, earthquake engineering, public education on hazards), National Institute of Aeronautics and Space – LAPAN (remote sensing images and analysis), Research Agency for Marine Affairs and Fishery – BRKP (remote sensing, tsunami and coastal hazards), Marine Geology Institute (marine geology and geophysics, coastal resources maps).

SECTION 3: TSUNAMI WARNINGS AND TSUNAMI MONITORING

Scope: Please outline your country's situation regarding tsunami warnings and tsunami monitoring. Below are some questions that should be considered in providing a description.

3A: RECEPTION OF WARNINGS FROM INTERIM SYSTEM

Question 17: Does your country currently receive international tsunami warnings for teletsunamis from the Pacific Tsunami Warning Centre and/or from the Japan Meteorological Agency?

Answer: YES (and also from ATWC)

Question 18: If yes, by what method and who receives it?

Answer: TELEPHONE, SMS, FAX, EMAIL AND GTS: NSC National Seismological Centre (of BMG) (underlined indicates primary method. There is currently no alert system to indicate arrival of message. GTS is quicker but access to GTS at the location of the centre is not ideal – no direct display of GTS messages at seismic centre; data access through LAN is available).

Note: Dr Kong referred to EMWIN as an effective way to capture GTS messages. It was recommended to set up an EMWIN station at seismic centre.

Question 19: Is there a back-up, or alternative method, for receiving the warning messages?

Answer: Multi mode reception

Question 20: Does this agency provide 24-hours-a-day, 7-days-a-week services?

Answer: YES

Question 21: If your country does not currently receive international tsunami warnings for teletsunamis from the Pacific Tsunami Warning Centre and/or from the Japan Meteorological Agency then would your country like to receive these and by what method? Available methods include e-mail, fax, EMWIN, GTS (Global Telecommunications System with WMO headers), AFTN/NADIN.

Answer: n/a

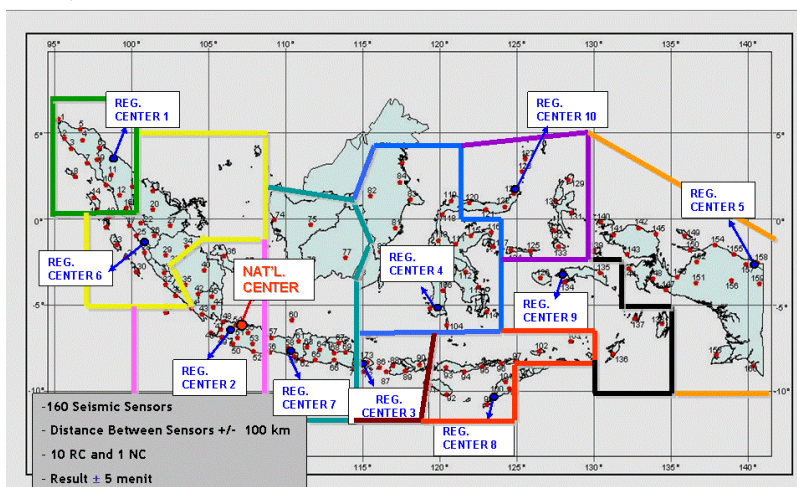
3B: NATIONAL TSUNAMI WARNING CENTRE

Question 22: Does your country operate, or intend to operate, a national or regional tsunami warning center to monitor and warn of regionally- or locally-generated tsunamis?

Answer: YES. BMG already acts as focal point for Indonesia. It is planned for BMG to host the national tsunami warning centre (there will be 1 national centre and 10 'sub-national' centres). It already hosts the ASEAN earthquake information centre (AEIC). The target date for the formal establishment of the national TWC is 26 December 2005. It is expected that 3 sub-national centres will be established this year in North Sumatra, Bali, and Papua. See map below.



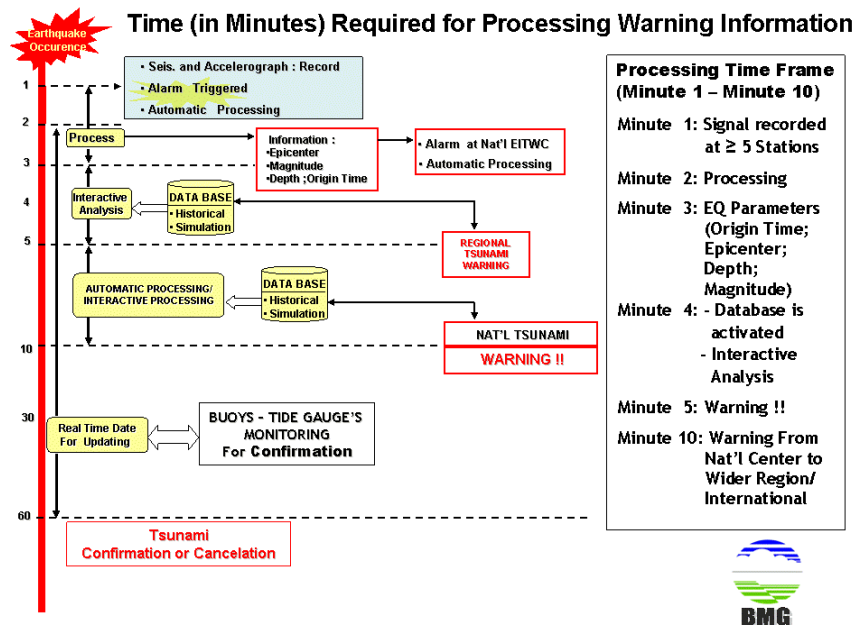
Indonesia Earthquake Information and Tsunami Warning Center (LONG TERM / START 2006)



Seismic monitoring system: before end of 2005 expect to install 25 stations; tide gauge: as part of IOC programme, stations to be installed also before end 2005; before end of 2005 and early 2006, Germany funded deep ocean sensors will be installed).

Currently the national tsunami warning centre (at BMG's NSC) issues EQ information only. There are plans to provide tsunami warnings using real or near real-time sea level data.

The sub-national centres will also have the capability to issue tsunami warnings in their own and adjacent areas as shown in the above figure. The backup to the national centre is a sub-national centre located close to Jakarta.



Note: timeline is indicated above

Question 23: If yes, please provide information on the system (data networks, evaluation methods, and message dissemination processes).

Answer: BMG.

For national dissemination BMG is the centre. For regional dissemination, under ASEAN, the AEIC earthquake parameter information and tsunami information from PTWC, JMA and ATWC is currently shared. Under ASEAN there is a plan for the sharing of seismic wave form data. The planned stations are shown in the figure below. Implementation of upgrades necessary for sharing are the responsibility of each country.

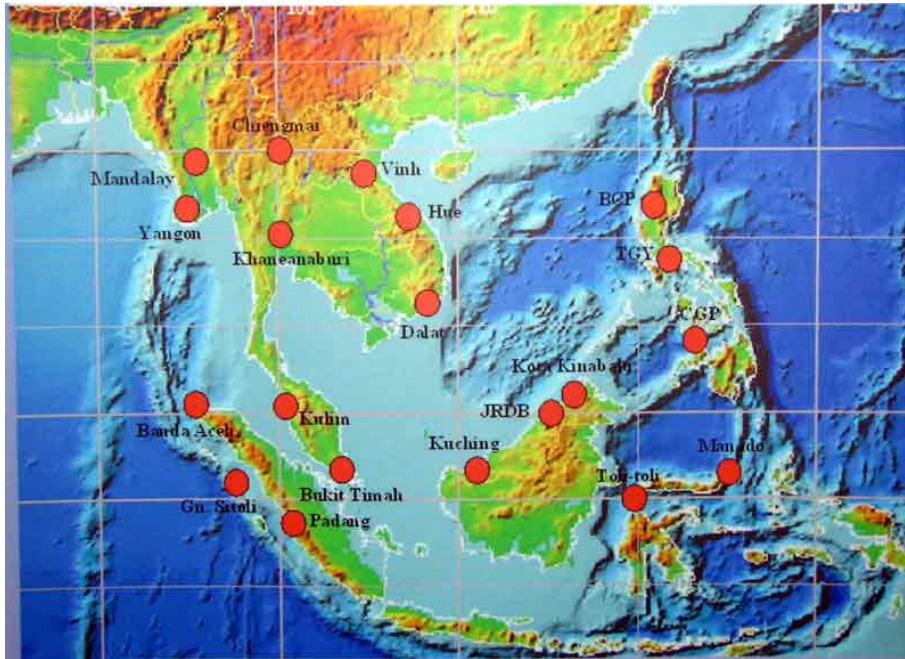


Figure: Proposed ASEAN supported exchange of seismic wave form data

Question 24: Does the warning center have staff that are always present in the operations center 24-hours-a-day, 7-days-a-week, or are staff on an on-call basis through automated processes which notify the on-duty staff through a phone message or pager?

Answer: present operations 24-hours-a-day, 7-days-a-week. Presently two staff are always present. In November a third person will be added. In the event of a significant earthquake, 2 additional staff can be called in, as well as the Officer-in-charge.

3C: TSUNAMI WARNING ALARM INFRASTRUCTURES

Question 25: Does your country use alarms and other types of paging systems to notify staff of tsunami alarm events?

Answer: Currently cellphone (SMS/voice call) and fixed phone (voice call). For M>5 SMS messages are broadcast to BMG staff. For M>6 officials in relevant agencies are contacted by SMS as well. Voice calls are made for “significant” events (ie events with potential destructive impact: shallow felt and offshore). For M>7 Ministers will be informed by SMS (eg Minister of Sci and Tech, Comm. & Information; Min of Transportation; Office of the President; Minister of Internal Affairs). At this moment no dedicated/reserved telephone lines are available. There is a cellphone of which the number has only been provided to certain officials (unregistered number). Currently no radio system is available. Police uses VSAT for communication at national level. For local level VHF is used.

Note: Recommended to involve police to handle liaison if national telecom system has collapsed.

Question 26: *Are these dedicated notification systems, or do they use commercial services?*

Answer: They use commercial services. Additional comments see 25. It is planned to use a custom system (using radio link at local level, satellite system at national level).

Question 27: *If so, who is notified, and does this include both warning centre staff and emergency response officials?*

Answer: see 25

3D: SEISMIC NETWORK

Question 28: Does your country operate any seismographic stations or seismograph networks to monitor regional seismicity?

Answer: YES

Question 29: If yes, please describe the system or institution, including location, instrumentation and telecommunications and analysis.

Answer: see figure under question 22. The current network is supplemented with stations from the GSN. (eg Diego Garcia). The data used by the new automatic processing system uses data from Australia, Malaysia, etc. See below figure for the network of regional stations used.

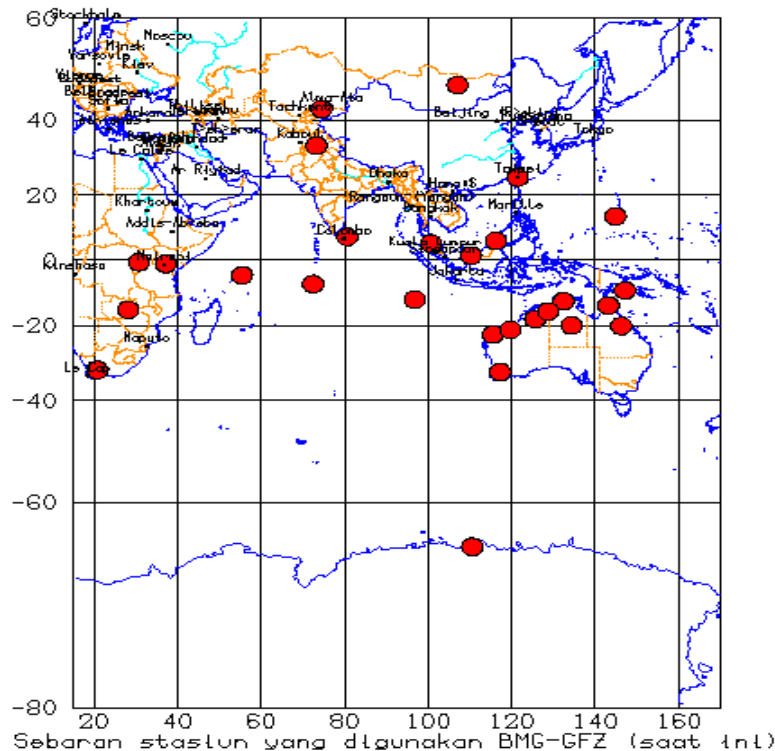


Figure: regional network uses by the automatic system

Question 30: Are the data available in real-time in your center?

Answer: Yes. (Banda Aceh (BSI), Parapat (PSI), Gunung Sitoli (GSI), Jayapura (JAY), Padang Panjang (PPI), Kappang (KAPI) will all be available internationally by the end of September 2005).

Question 31: Can you provide these data in real time and how?

Answer: GSN station data are already available to all. For the Indonesian (donor supported) national network data are shared with each donor. Other national requesting data will need to consult with the relevant donor country and Indonesia.

Question 32: Does your country operate any seismographic stations or seismograph networks to monitor local seismicity?

Answer: yes. See 29

As networks are upgraded new staff will be added in the sub-national centres and both new and existing staff will need to be trained to be able to operate and maintain the monitoring centre.

3E: UTILIZATION OF SATELLITE SYSTEMS FOR MONITORING, DATA COLLECTION AND DISSEMINATION (WMO)

Question 33: Is your country aware of the satellite capabilities offered through different countries in the region?

Answer: Yes, It is. Through LAPAN (National Space Agency) and other government agencies, Indonesia operates several satellite remote sensing ground stations to capture data from different satellite such as Landsat, Spot, Terra/Aqua-Modis, NOAA-AVHRR, Feng Yun, and with International collaboration (Acres-Australia, Macres-Malaysia, Crisp-Singapore, Gistda-Thailand, Jaxa-Japan, USGS-USA, etc) LAPAN can provide high resolution satellite data such as Spot-5, Ikonos, Quickbird, ALOS (in the future), and Indonesia soon will launch micro satellite for quick surveillance. Beside those capabilities, Indonesia through state government and private companies operates several telecommunication satellites (Palapa-C, Telkom-1, etc) to cover and connect the whole of Indonesia territory and regions. Indonesia uses satellites for transmission of collected seismic, sea level and GPS data. Currently these data are not immediately available for use in tsunami response.

Question 34: *What is the current capacity (equipment to receive, technical ability to access and interpret, etc) of your country in utilizing satellites for hazard monitoring, data collection and exchange?*

Answer: Indonesia through LAPAN and other agencies operates some small and large size antennas with 2.5 m, 10m and 11m diameters using X band, C-Band, S-Band and L-Band receiver capabilities. Some of them are located in Biak (Papua), Parepare (Sulawesi), Samarinda (Kalimantan), Rumpin (Bogor), and Jakarta. The processing, analyzing and image interpretation work is conducted mostly in Jakarta and other sites. The facilities are equipped with a SGI/Irix System, several Work Stations, plotters and scanners for data reproduction. Data/Information archiving and dissemination services are provided at near real time and on-line, through internet services (for high temporal resolution satellite data i.e : Terra/Aqua, NOAA). Some research activities related to remote sensing applications, especially for hazard monitoring such as drought, forest fires, and floods have been done for a decade. These activities utilized multi-temporal satellite data such as NOAA-AVHRR, Terra/Aqua MODIS. LAPAN and other agencies such as the Ministry of Forestry have archived NOAA-AVHRR Data for over twenty years, and these have been distributed to other research agencies such as Bogor Agriculture University, University of Udayana, University of Sriwijaya etc.

Related to the tsunami in NAD-Aceh, LAPAN provided satellite data which were utilized for quick response activities, rough vulnerability assessment, and quick evaluation of the impact of the tsunami. Some high resolution satellite data provided by international agencies have been reproduced and submitted to the government coordinating agency (Bappenas), BPN etc.

Note: It was not known how long it took for data to become available (hours, days, weeks)

Now, with other National agencies (BMG, LIPI, BPPT, Bakosurtanal, Bakornas etc), LAPAN will provide LUC (land use coverage) data derived from high resolution satellite imagery for Padang City (as the Pilot Project Site), especially for the TEWS preparedness program.

Note: The team inquired how MODIS satellite data are received. No answer was available.

Question 35: *Please describe through which satellite systems you are receiving data? What kind of data and how?*

Answer: Voice, Text and Image data can be transmitted via National Satellite (Palapa-C, Telkom-1) as a repeater through VSAT provider (CSM, Lintas Arta). The data will include – Seismic data, VSAT IP and VSAT Link to other operation/warning centers.

Remote Sensing satellite systems (Landsat, Spot, NOAA, Envisat, etc) have been utilized to provide geo-spatial data with certain sensor capabilities from optical to radar sensors. This data can describe the condition of tsunami affected area after conducting some processing, analyzing, and interpretation. It was not clear whether this is currently implemented by Indonesia.

Question 36: *What are the major obstacles faced by your country with respect to the use of satellites for hazard monitoring, data collection and exchange? If they are not used, please specify why (lack of technical expertise, lack of funds, lack of equipment, or other reasons).*

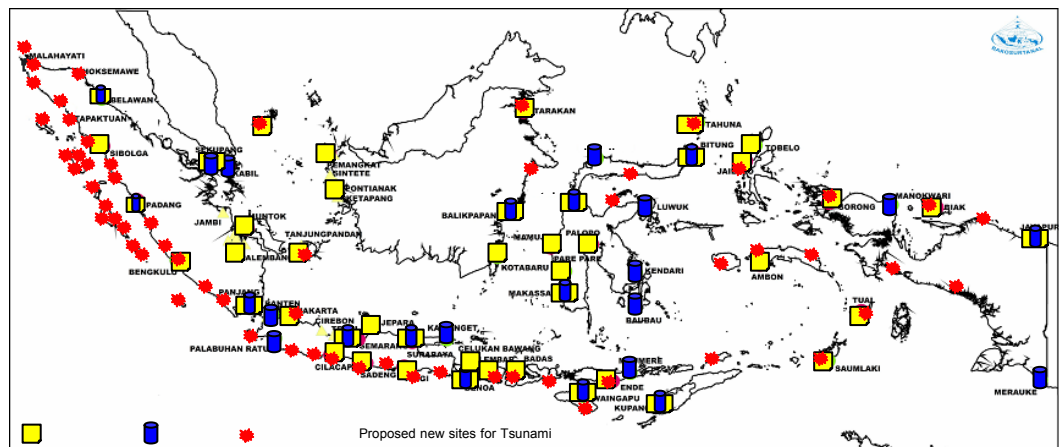
Answer: Some satellite technology has been utilized for hazard monitoring and geo-spatial data collection at moderate level. Problems relate mostly to financial and infrastructure limitations, as well as coordination to maximize the use of both telecommunication and remote sensing satellite technologies. In the future, both satellite technologies can be integrated for the benefit of hazard monitoring national program.

It was not clear whether there are plans to improve the situation.

3F: SEA LEVEL NETWORK

Question 37: Does your country operate any sea level stations (coastal or deep-ocean instruments) to monitor sea level?

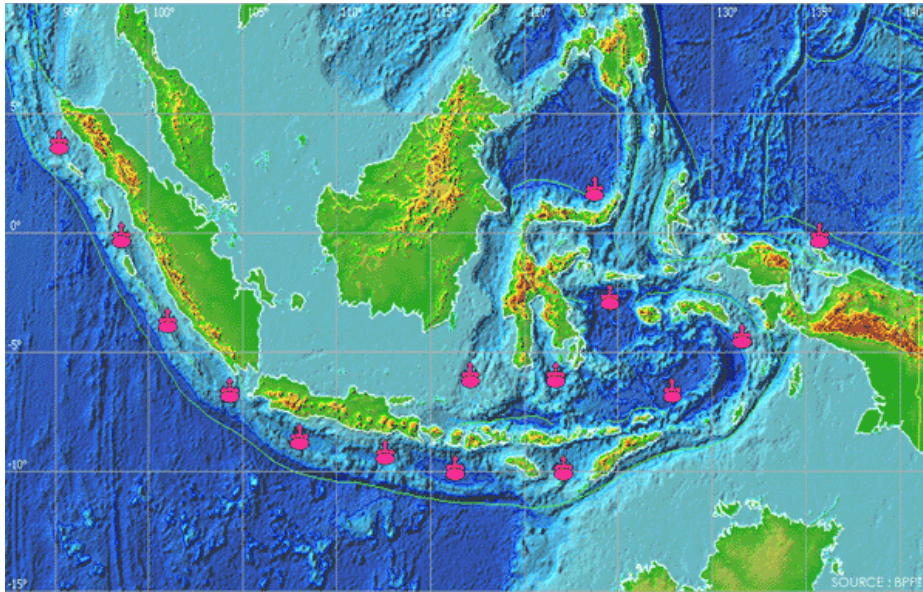
Answer: Yes. Indonesia operates 60 permanent sea level stations with the existing station distributions, including the proposed additional stations, as can be seen in the figure below. An additional 60 real-time stations are planned. Under the GLOSS programme, with cooperation from NOAA, 9 existing stations (of the existing 60) are planned for upgrading in 2005 and 2006. One station (Sibolga) has already been upgraded recently in April to near real-time mode transmitting to GTS. 25 of the existing 60 stations are digital stations (digital recording) with dial-up capability. 35 stations are analog stations requiring manual digitization.



National Sea Level Monitoring Network of Indonesia

DART:

See below a draft site location map (proposed by BPPT) for the planned deep ocean pressure sensors. This will be discussed in more details with the donors (Germany, Norway) who have offered support through the provision of deep ocean pressure sensors. Germany will undertake a site survey starting October 2005 of the Indian Ocean side to determine suitable locations.



Question 38: *Are these stations available real-time to the central monitoring site, or available in near real-time to the PTWC/JMA for use in the IOTWS?*

Answer: The Sibolga station located on the west coast of Sumatra has been operating in real time mode since 22 April 2005, and there are 25 stations in near real time mode using telephone cable connections (see figure above).

Sibolga station data are already shared and available to PTWC/JMA for use in the IOTWS. Other new planned station data will also be shared through the IOTWS. Other station data (of existing stations) will be made available upon request from Bakosurtanal.

All real-time sea level station data (transmitted through the GTS) collected in Indonesia coastal waters along the Indian Ocean and Pacific Ocean will be available for tsunami warning purposes through the IOTWS and ITSU respectively.

Question 39: *Do these stations sample sea levels frequently enough and transmit their data frequently enough to resolve short-wavelength tsunami (e.g. do they sample at 1 min or less intervals, and transmit their data every 15 minutes or less to a central site or by satellite)?*

Answer: Both the real time (using GTS) and digital on line stations (dial-up) are operating in high sampling rate less than 1 minute. The former transmit the data every 15 minutes with facility capable of triggering the system to send the data more immediately if any extreme sea levels such as tsunami might occur while the latter are downloaded via telephone modem weekly.

Question 40: *If yes, please describe the system or institution, including location, instrumentation and telecommunications and analysis.*

Answer: The system data flow of graphical chart and digital with cable telephone can be seen in the figure below while the station location in the previous figure (37). Bakosurtanal, the responsible institution operating the network, carry out data processing and analysis based on GLOSS standard. Currently there is no capability at BMG or Bakosurtanal to download GTS transmitted data, decode and display them in real-time.



Data Flow of Sea Level Monitoring System

Question 41: If other digital data are available in your center, can you provide these data to the PTWC/JMA?

Answer: Yes, our institution can provide service for the provision of offline data archive (consisting of 40 stations) by special request and agreement without prejudice to national sovereignty.

3G: INTERNATIONAL COORDINATION

Question 42: Are there international agencies, besides the IOC of UNESCO, or through bilateral or other assistance, any countries, universities or other technical institutions that you are coordinating, working with, or who are providing services to strengthen your tsunami monitoring, evaluation, warning capabilities?

Answer: YES

Device/ Activity	Planned	Existing	International Cooperation
Seismograph	160 units (real-time)	58 units (short period) 30 units non real-time And 28 units real-time	Germany 20 units China 10 units Japan 15 units CTBTO 6 units USA USGS, Caltech: 6 station upgrading including real-time satellite telemetry France: TREMORS software
Accelerograph	500 units	-	-
Tide gauge	120 units of digital tidal recording	60 units (35 analog, 25 digital)	Germany: 5 tide gauges
DART buoy	15 units of buoy with sea floor bottom pressure sensor	12 units to only monitor sea & environment	Germany: 10 surface buoys, 20 BPS Norway: 5 surface buoys, 5 BPS
GPS	Continuous GPS (27 GPS near tide gauge, 10 GPS near buoy)	9 units operated by Bakosurtanal (see figure) 24 units installed by Caltech and operated by LIPI and Caltech	Germany: 10 coastal GPS stations (see figure) USA USGS, Caltech: upgrade of 8 existing Caltech stations to real-time telemetry

Device/ Activity	Planned	Existing	International Cooperation
Centre	1 national centre 10 regional centre	5 regional centres	-
Numerical modeling	Inundation mapping Tsunami simulation	See questions 73, 74, 75, 82	Tohoku University Hokkaido University Tokyo University

Note: the meeting took note that there are other countries who are already, or have expressed interest in providing additional support (eg Australia, France, USA – USTDA, Japan)

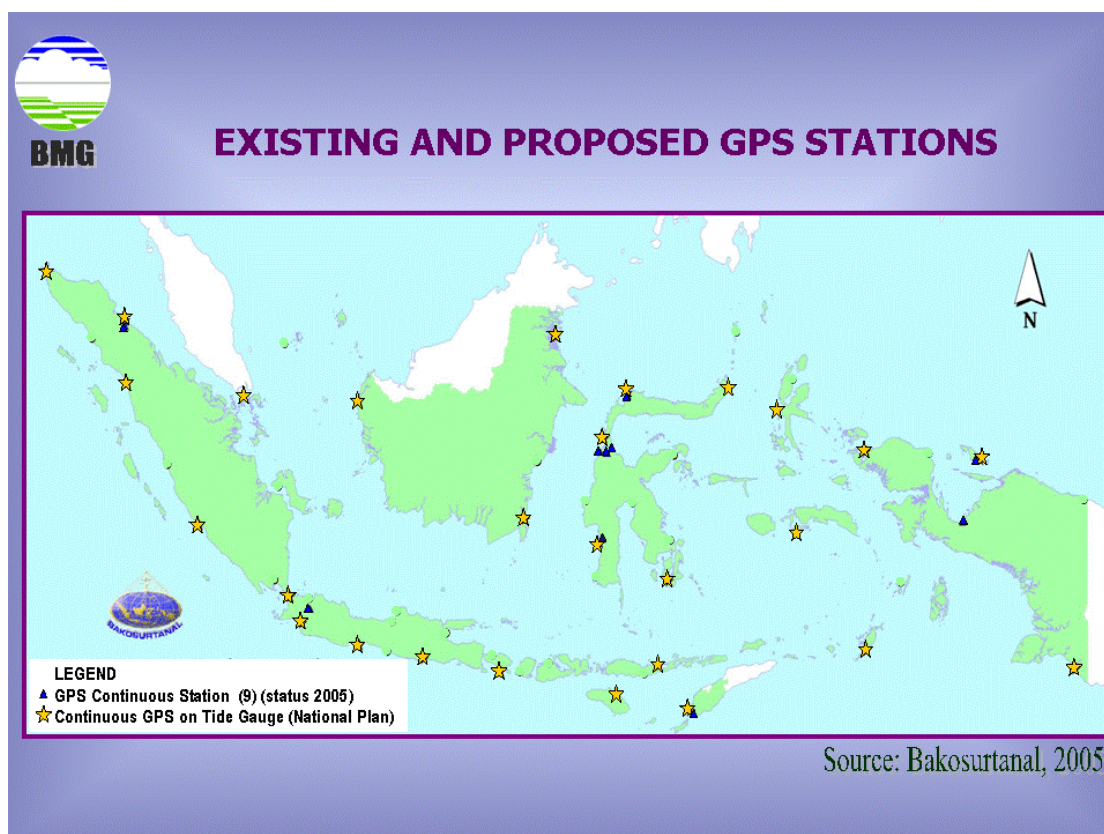


Figure: existing and proposed GPS stations (does not include existing or planned Caltech stations)

Note: a number of cooperative research activities are occurring augmenting existing national network. Discussions are required to determine whether these will become part of the permanent monitoring network.

Note: no information available on planned location of Norway BPS. A German RV will do a site survey starting in October to determine best locations for the BPSs.

SECTION 4: TSUNAMI WARNING RESPONSE AND EMERGENCY PREPAREDNESS

Scope: Please describe your country's situation regarding tsunami warning response and emergency preparedness. Below are some questions that should be considered in providing a description.

4A: WARNING DISSEMINATION AGENCY

Question 43: Who is the designated agency for receiving and acting upon the tsunami advisory message from the tsunami warning center?

Answer: At this time there is none. Proposed is as follows: BAKORNAS (national); then down to provincial (Satkorlak) and district level (Satlak) and then to community.

Currently, BMG will send information also directly to Satkorlak and Satlak. Department of Communication and Information (KOMINFO) was appointed to be responsible for ICT component and has begun to discuss exercises with telecom providers and radio.

Question 44: *Does this agency have authority by law?*

Answer: YES (BAKORNAS: by Presidential Decree). This will be strengthened by the proposed law (see above). Note that at this time there are no “standard operational procedures” available that designate the role of all agencies.

Question 45: *Does this agency issue public evacuations?*

Answer: BAKORNAS does not (national level) but the provincial (Satkorlak) and district level (Satlak) agencies do issue public evacuation. Note that the Army is member Satkorlak and Satlak.

Question 46: *If not, who are the responsible agencies?*

Answer: see 45

4B: CAPACITY-BUILDING ASSESSMENT

Question 47: *Have you assessed your existing disaster management system and identified the requirements of individuals and institutions for training and capacity-building?*

Answer: Partial assessment has been done, mostly of the technical expertise needed by LIPI. However a comprehensive assessment of capacity deficits in all the relevant sectors of Disaster management has not been attempted. The technical capacity assessment by LIPI provides the following gaps and deficits

Recommendations include:

- Design education and information programs on disaster awareness and preparedness.
- Develop capacity and skills and strengthen coordination systems for disaster management.
- Develop community disaster management programs that involve local government, and other agencies
- Improve capacity to provide early warning system.
- Develop national disaster preparedness plan and contingency plans.

Summary of Capacity Building and Preparedness:

- Existing capacity
 - Essential capacity (core group) of basic research on geodynamocs, (paleo)seismology, earthquake engineering and tsunami related research (modeling, database, paleotsunami) and relevant technology and system
 - Customized public education and preparedness expertise and experience
 - Good network of research, monitoring, technology and public education and preparedness
 - Organizing public education and preparedness training and workshop for the nation and the neighbouring countries

Human resources needs:

- S3 seismologist: 33 persons
- S3 geophysicist: 11 persons
- S3 oceanography: 11 persons
- Minimum D3: 180 persons

4C: TSUNAMI RESPONSE PROCEDURE (DISTANT OR REGIONAL TSUNAMIS)

Scope: After receiving an international tsunami advisory message (distant tsunami), what are the procedures for responding? Response procedures should typically answer the following questions:

Question 48: *What criteria are used by the designated emergency authority to determine whether an evacuation should be issued, i.e. how is the science-based tsunami warning message translated into public guidance?*

Answer: So far no warnings have been issued so no experience is available. Formal criteria have not been defined. The following are being considered:

1. Rapid assessment and evaluation of the advisory (while waiting for confirmation or cancellation)
2. Activate the “hubs” of the corresponding responsible agencies and organizations according to standard operating procedure
3. Check and re-check to national warning center (BMG)
4. Mobilize the people according to the evacuation plan by sectorally, temporally and spatially.

Question 49: *How is that information disseminated to the public? Are there sirens, or other emergency broadcast methods for immediately broadcasting warning messages? Are these all-hazard, specific to a certain hazard, or tsunami-specific? If an early warning notification system exists to alert communities, please briefly describe.*

Answer: There are no sirens; at this moment the earthquake information is broadcast by SMS (to Government officials/leaders); BMG can cut into TV and radio broadcasts for emergency messages (but no dedicated telephone line); other methods used are fax (to Government officials/leaders), internet. These are for multiple hazards, not tsunami-specific.

To alert communities: population can subscribe to receive SMS messages. Brochures exist that explain how to do this. [comment: network saturation risk]. Discussions are ongoing with telecom providers selective dissemination (to certain officials and contacts).

Question 50: *Are there tsunami emergency plans, tsunami evacuation plans and/or signage indicating evacuation routes to safety or higher ground?*

Answer: Yes, some initial efforts exist in the Pilot Project sites in Padang

Question 51: *Are there marine warnings, and is there guidance or instructions for marine vessels, harbours and ports?*

Answer: Warnings: Not specifically for tsunami but there are warnings for storm surges, issued by BMG (for boats). These warnings are sent to Port Authority and also broadcast through radio system of Department of Fisheries. No details available on transmission range. Information also sent to newspapers daily. Note that BMG has 7 marine stations.

Guidance: no

Question 52: *When an evacuation is issued, is the public required by law to evacuate or is it an evacuation advisory only?*

Answer: Not yet by law. Effort to legalize it is underway.

Question 53: *Are there procedures or criteria for when it is safe for responders or the public to return?*

Answer: No.

4D: ISSUANCE OF WARNINGS FOR MARINE SAFETY

Question 54: *Does the National Meteorological and Hydrographical Service (NMHS) have a mechanism for warning mariners (e.g. communication system NAVTEX, access to INMARSAT Safety-Net)? Please specify current capabilities.*

Answer: see 51. No use of NAVTEX, Safety-Net etc.

Question 55: *Do the NMHSs issue marine forecasts and warnings (e.g. storm and gale warnings, weather bulletins, etc.) to the mariners and coastal zone users in their region, and how? (e.g. GMDSS fax, facsimile and radio, or other)*

Answer: Yes: shipping bulletins are provided to Port Authority (Department of Transportation, Directorate General for Sea Transportation). They transmit by radio.

Question 56: *How are the contents of the warnings for mariners formulated? Are these developed within the NMHS or in collaboration with other agencies? Please describe.*

Answer: Formulated by BMG (following IMO standard)

Question 57: *Are these warnings effective and timely? What are the weaknesses associated with the current marine warning systems that you utilize in your organization?*

Answer:

Effective and timely: yes. Weaknesses: we have only 7 marine stations (synoptic) so observations are limited.

Question 58: *In light of the short time window for tsunami warnings what are the strengths and weaknesses of the current warning mechanisms you utilize for issuance of warnings to mariners and coastal zone users? Do you need assistance in formulation of the warnings, enhancement of your communication mechanisms, or other subjects (please specify) to address specific requirements for tsunami warnings?*

Answer:

Strengths and weaknesses: problem will be that the current system uses conventional methods and is slow. Need assistance?: yes

4E: DISSEMINATION PROCEDURE (LOCAL TSUNAMIS)

Question 59: *For the case of a regionally or locally generated tsunami, do you have procedures for responding?*

Answer: no (at national scale). Procedures have been developed for the Padang experiment.

4F: DISSEMINATION PROCEDURE (EARTHQUAKES)

Question 60: *Does your country have response procedures for earthquakes? If so, do these include tsunamis?*

Answer: Not formally (drafts exist, circulated internally). BAKORNAS also has procedures written down but requires updating.

4G: RESPONSE PROCEDURE DRILLS/EXERCISES

Question 61: *Are your procedures tested or exercised to improve the response through better planning and preparedness?*

Answer: Initial community based (bottom up) efforts were attempted in Aceh and Padang to establish a standard and local specific procedure and assessment is on going.

Question 62: *If yes, please describe how this is done, who is involved, and whether it is done regularly.*

Answer: Involved: Mayor, Satlak (including police, army, ambulance), NGOs, civil defense, health services, public works, water utility company, religious organizations, prominent persons.

This is announced through the radio (there are official broadcasters in the area), newspaper. Frequency: 3 times (4th time will be 1 Sep 2005)



4H: CONSIDERATION OF CRITICAL INFRASTRUCTURE

Question 63: *Have you identified critical infrastructure and lifeline support facilities (hospitals, ports and marine facilities, land transportation, energy utilities, telecommunications, etc.) and made plans to ensure minimal government services after a destructive tsunami, or other natural disaster?*

Answer: In the Indonesian Earthquake-resistant Building Code, the critical infrastructures have been given special attention by giving them higher importance factor. It means, these structures should be built at a higher level of strength than other types of structure.

Note: in the case of Padang buildings are being assessed from an structural/EQ resistance point of view (including whether they are appropriate for vertical evacuation).

New airport, bridges and mosque are being assessed.

[note: Indonesian building code is in line with universal building code UBC of 1989 (0.3 g). This will be revised after Aceh earthquake (0.35 g).]

4I: OTHER LOCAL CONTACTS

Question 64: *Please provide local reporting contacts that the PTWC/JMA can contact during a tsunami alarm to confirm that a tsunami has occurred. Eyewitness observations or other local information are especially important for monitoring the destructiveness of the tsunami as it propagates across the Indian Ocean.*

Answer: some contacts have been identified in Padang. Other additional contacts available. (list available but not to be included in this report)

4J: POST-TSUNAMI SCIENCE SURVEYS

Question 65: *After a damaging earthquake and/or tsunami, does your country carry out post-event data surveys to assess damage and collect tsunami run-up/inundation data?*

Answer: Yes, quite a number of surveys were carried out, including post tsunami survey with the ITST (International Tsunami Survey Team), in which LIPI, ITB, BPPT, USGS and Russian Institute was involved. A joint Indonesia – Norway coastal resources and environmental survey was carried out by using our R/V Baruna Jaya VIII in July – August 2005.

Question 66: *If yes, what organization(s) usually carry out this task?*

Answer: MGA, LIPI, ESDM, Bakosurtanal (land-survey), BPPT (sea-survey using research vessel), University, DKP

4K: INTERNATIONAL COORDINATION

Question 67: *Are there international agencies, besides the IOC of UNESCO, or through bilateral or other assistance, any countries or other institutions that you are coordinating, working with, or who are providing services to strengthen your tsunami warning response? If yes, please indicate who and describe the assistance.*

Answer: See question No. 42 and 43

SECTION 5: TSUNAMI HAZARDS AND RISKS

Scope: Please describe your country's situation regarding tsunami hazards and risks, including tsunami numerical modelling. Below are some questions that should be considered in providing a description.

5A: TSUNAMI HAZARD STUDIES

Question 68: *Have studies been done to document the tsunami hazard in your country or region (either before or after 26 December 2004)?*

Answer: YES

Question 69: *Do you have a good historical record of past earthquakes and tsunamis?*

Answer: YES

Question 70: *If yes, please provide references to those studies.*

Answer: See Danny Hilman, Hamzah Latif and Nanang Puspito

5B: TSUNAMI VULNERABILITY STUDIES

Question 71: *Have studies been done to identify vulnerabilities and then to document the tsunami risk in your country or region?*

Answer: YES (e.g. in Flores which was hit by the 1992 tsunami, Banyuwangi in 1994, and Aceh/Nias in 2004/2005, Biak in 1996).

Question 72: *If yes, please provide references to those studies, and generally describe your tsunami risks.*

Answer: Tsunami Hazard and Its Effects on Indonesia Coastal Region (BPPT-JICA, 2001- March 2004) – requested copies.

5C: NUMERICAL MODELLING STUDIES

Question 73: *Have numerical modelling studies been done to calculate inundation from tsunamis in your country?*

Answer: YES, for some area. Modeling has been done for 10 locations in the country (see slides in the LIPI presentation). More detailed and improvement are carried out for the city of Padang.

Question 74: *If yes, please provide references to those studies and indicate where the studies were conducted.*

Answer:

- Tsunami Hazard and Its Effects on Indonesia Coastal Region (BPPT-JICA, 2001- March 2004)
- See slide 19 of LIPI presentation

Question 75: *If no inundation modelling has been done, does your country plan to do this in the future?*

Answer: This is done through our expansion program for the nation-wide coverage of the modeling program.

Question 76: *Is technical training required to build this capacity?*

Answer: Yes, to improve the existing capabilities and, just in case, to see if there is any updated version exist. We would rather say that the program is better called as exchange program than training for us. Our scientists are able to share and conduct training for our own purpose as well as for the neighbouring countries. This practice has been going on through trainings organized by Thailand recently that involved many of Indonesian scientists as trainers quite a lot. Our scientists are ready to train participants in the IOC run training program.

Question 77: *Does accurate bathymetry and topography data exist for the coastlines (30 m grid resolution or better), or does data need to be collected first?*

Answer: data need to be collected first.

5D: GIS USE

Question 78: *Are geographic information systems (GIS) used as a decision support tool during emergency response?*

Answer: Yes, as part of the national database program carried out by the Bandung Tsunami Group involving primarily ITB and LIPI. The general GIS expertise is with universities. The application of GIS to earthquake and tsunami is with Bakosurtanal and LAPAN.

Question 79: *If yes, are building inventory, critical infrastructure, demographics, emergency response and evacuation, bathymetry and topography, tsunami, earthquake or other hazard or risk data layers available?*

Answer: Yes, progress is made in 10 locations, moreover, priority is given to Padang.

5E: INTERNATIONAL COOPERATION

Question 80: *Are there international agencies, or through bilateral or other assistance, any countries, universities, or other technical institutions that you are coordinating, cooperating with, or who are providing services for conducting tsunami hazard and risk assessments, and/or numerical modelling?*

Answer: yes

Question 81: *If yes, please indicate who and describe the assistance.*

Answer: Yes, see question 42. Others include Tohoku University, Geological Survey of Japan, Geomath consortium (Netherlands – Indonesia: ITB, BMG, LIPI, Twente University, Delft Hydraulics, and others).

5F: POST-TSUNAMI SURVEYS

Question 82: *Have post-tsunami impact assessments been conducted in your country?*

Answer: Yes. See question 66. Others include cooperation with Caltech (California Institute of Technology), JAMSTEC (Japan's R/V), British Geological Survey (HMS Scott), IPG France (R/V Marion Dufresne), Oregon University, Hokkaido University, Kyoto University, Tohoku University, Red Cross, AUSAID, and numerous others (many were presented in the recent Padang Conference in August 24 – 28, 2005. Complete list are available on request).

Question 83: *If yes, what types of data were collected? For example, structural and non-structural physical damage, run-up and inundation, geological, geophysical, and oceanographic tsunami signatures, emergency response, public perceptions of hazard and response.*

Answer: All of the above mentioned data, including: structural and non-structural physically damage, run-up and inundation, vertical and horizontal displacement, (marine and terrestrial) geological and geophysical, and oceanographic tsunami signatures, emergency response, public perceptions of hazard and response. There is also the damage assessment report prepared by BAPPENAS (available from their web site).

SECTION 6: TSUNAMI PUBLIC AWARENESS AND PREPAREDNESS, AND COMMUNITY-LEVEL ACTIVITIES

Scope: Please describe your country's situation regarding tsunami public awareness and preparedness. Below are some questions that should be considered in providing a description.

6A: ASSESSMENT OF LOCAL-GOVERNMENT PREPAREDNESS AND EMERGENCY RESPONSE

Question 84: Have you assessed your local government disaster preparedness and emergency response? For example, are there local emergency operations centres, alert systems, incident command processes for response?

Answer: Yes, for the case of Padang and Banda Aceh now.

Question 85: How have you ensured, or will you ensure, that the information given to ordinary citizens during a warning is understood and then acted upon in an appropriate and timely manner (for example, by meetings, mass media, schools, drills, community activities, etc)?

Answer: community center meetings, drills (e.g. in Aceh and Padang). Train the trainers activities will also be planned. Red Cross will also implement activities (community education, brochures,...)

6B: ASSESSMENT OF COMMUNITY PREPAREDNESS AND EMERGENCY RESPONSE

Question 86: Have you assessed your community and ordinary citizen disaster preparedness and emergency response? Is there public awareness of tsunami hazard and risk?

Answer: No. Pilot projects are under execution to increase awareness. Assessment of preparedness will need to be assessed later.

Question 87: Is the public aware of what a tsunami is, and how to respond to both locally-generated and distant tsunamis

Answer: Yes they know what it is. It is unclear whether they know how to respond (at national level). At the local level in Padang they know now. In Simeulue Island there is traditional knowledge about tsunamis so they know how to respond (casualties were minimal after 26/12 tsunami).

Question 88: Are there any community-level education and preparedness programmes for national hazards or tsunamis?

Answer: Yes, Padang and Aceh are underway. These are implemented by various organizations (governmental and NGO)

Question 89: If yes, please describe how the awareness and preparedness was achieved (for example, through brochures, education, meetings, etc.).

Answer: Through quite a variety of media: trainings, brochures, stickers, books, comics, TV Talkshows, radio broadcastings, continuous articles and news in various national and local newspapers, community drills in public and schools, games and simulations.

PUBLIC EDUCATION CAMPAIGN FOR EARTHQUAKE HAZARD AWARENESS

- OBJECTIVE**
 - To develop a suitable method for earthquake hazard awareness campaign at the school children level
 - Collect available campaign material Develop format of the broadcast program
 - Select several pilot project schools for testing
 - Implement special classes and awareness day at selected schools
 - Assessment of awareness improvement
 - Formulation of improvement for the campaign material
- PRODUCT/OUTPUT**
 - Earthquake picture dictionary, drawn by school children
 - Poster, leaflet and booklet on earthquake
 - Video cassette on workshop and earthquake drill activities

What should you do during an earthquake?

GEMPA BUMI

Question 90: *What types of outreach have been conducted and who conducts them?*

Answer: People based, bottom up programs. Conducted by LIPI, BAKORNAS, Local governments, local NGOs, Red Cross, AUSAID.

Question 91: *What is planned for the future to increase or sustain the awareness and preparedness?*

Answer: Replicate the program in pilot areas to other areas through ToT (training of trainers) Programs.

6C: COMMUNITY PARTICIPATION

Question 92 : *Do local authorities engage in community-level, citizen-based, stakeholder participation in developing and deciding risk avoidance and mitigation activities?*

Answer: Yes

Question 93: *Is community-based, risk-based decision-making used? In other words, at the community level, are tsunami mitigation and emergency response decisions based on knowledge of the known local risks and the potential impacts of tsunami on the specific community?*

Answer: Yes. Improvements are being made. Red Cross is doing Participatory Rapid Assessment (PRA) of community knowledge.

Question 94: *Informed people at the community level may be the ones best suited to make decisions for their own communities on the risk level they are willing to tolerate or retain, and the risk level they want to transfer to someone else. Have local risk assessments been carried out, or are they necessary?*

Answer: There is currently no comprehensive plan to address this issue at the national level. Red Cross is undertaking some assessment at the local level (in Aceh province).

6D: PEOPLE-CENTERED EARLY WARNING MECHANISMS

Question 95: *Do non-government, people-centred, community-based organizations, such as the local Red Cross/Red Crescent Society, play a role in the receipt and delivery of tsunami or multi-hazard early warnings to people at the local level?*

Answer: Yes.

Question 96: *If yes, please describe their role and activities.*

Answer: . In Padang, local NGO (e.g. KOGAMI – Komunitas Siaga Tsunami = Tsunami Prepared Community) is assessing the current and past capabilities and working with local authorities and government to improve the delivery of warnings. Unlike in Bangladesh and Iran, there is no formal, legally mandated role for Red Cross/Red Crescent Society to deliver warnings to the public at large

Question 97: *If no, is there an interest in involving these organizations as an early warning mechanism that carries messages from national authorities to communities and into households? Please specify which organizations.*

Answer: n/a

6E: PEOPLE-CENTERED PREPAREDNESS MECHANISMS

Question 98: *Do non-government, people-centred, community-based organizations, such as the local Red Cross/Red Crescent Society, play a role in the early warning preparedness and community outreach and education to people at the local level?*

Answer : yes (eg Red Cross)

Question 99: *If yes, please describe their role and activities.*

Answer: In Padang: KOGAMI produces education materials, evacuation maps, SOPs, training activities, community drills, awareness through radio broadcasting and TV Program and door to door

campaign, cartoons, in mosques also, network with Radio Communication Organisation (ORARI), participate in national and international seminars/meetings.

Question 100: *If no, is there an interest in involving these organizations as a preparedness mechanism to reach communities and households? Please specify which organizations.*

Answer: n/a

6F: EDUCATIONAL MODULES OF THE TSUNAMI NATIONAL FOCAL POINTS

Question 101: *As the designated national tsunami focal point, do you have a tsunami education and public outreach programme currently in place or planned for the future? If yes, please describe and provide implementation time line if planned.*

Answer: This is planned in the draft grand scenario of Indonesian TEWS in 2005 the program will be implemented in 2 locations.

Timeline for the community preparedness planning in Padang, West Sumatra



Question 102: *How does the plan address the different stakeholders (e.g., risk managers, media, and schools)?*

Answer: Discussion and plan is being organized.

Question 103: *Are other natural hazards, such as tropical cyclones, storm surges, earthquakes, and volcanoes, covered in this programme plan?*

Answer: Other hazards such as earthquake, volcanoes, landslides have already their own SOP. Integration will be done in the future.

Question 104: *How are educational materials distributed?*

Answer: Through direct contact with the local community, local government. Upscaling and duplication of the materials will be done upon additional support from the governments and donations/supports from domestic and international organizations.

Question 105: *Do you have training programmes for the media on tsunami hazards, mitigation, warning, and preparedness? If yes, please describe?*

Answer: Done while giving press release and conferences. More systematic program will be done in the future.

Question 106: *Do you have training programmes for the media on other hazards and their vulnerability? If yes, please describe.*

Answer: see 106.

Question 107: *Would availability of educational modules and training sessions customized to your particular culture/infrastructure be helpful to your organization and to raising public awareness in your country?*

Answer: Yes, a lot. We are ready to customize it in cooperation with donors and international organizations.

Question 108: *Through what mechanisms do you interact with your major stakeholders? Would you benefit from assistance/guidance/on-going contact with your national and regional partners through seminars and workshops?*

Answer: Seminars, consultation meetings, informal meetings, exchange of information, mailing list. We would benefit from assistance/guidance/on-going contact with our national and regional partners through seminars and workshops.

Question 109: *Would you benefit from on-going regional training activities strengthening the linkages of key organizations involved in the Early Warning Process (technical agencies, Media, Risk Managers, etc.)?*

Answer: Yes.

6G: EDUCATIONAL CURRICULUM

Question 110: *Are earthquake and tsunami hazards and preparedness part of the educational curricula taught to school children? If yes, please describe.*

Answer: Not yet. Soon it will be incorporated in the curricula in Padang.

6H: OTHER OUTREACH PROGRAMMES

Question 111: *Are there other funded programmes which have provided outreach, or is there a need for such programmes?*

Answer: Yes. Some initial successes have been recorded through COREMAP Program (coral reef mapping, ADB funded). More massive and extension to tsunami oriented outreach program is needed. Small cooperation has been conducted with Red Cross and AUSAID. More massive program is welcome.

Question 112: *If yes, what types of outreach are needed? For example, public awareness briefings, technical training or education, informational material (printed brochures, video, computer, etc), materials targeted for children, decision-makers, general public or targeted segments of the populations, indigenous populations.*

Answer: Reproduction and expansion to national level of the master products we have developed in pilot projects (eg Padang) (brochures, guidebook, pocket book, stickers, video program, TV Spot, Radio spot, dedicated articles in the news), Training of the Trainers, briefings.

6I: TSUNAMI MEMORIALS AND MUSEUMS

Question 113: *Are there any tsunami memorials, museums, interpretative signage or other public reminders of past tsunami impacts to your country?*

Answer: Not yet

Question 114: *Do you have plans to establish such reminders? If yes, please describe.*

Answer: Yes, in the forms of memorials in Banda Aceh and Earthquake / tsunami museums in Jakarta.

6J: STRUCTURAL MITIGATION EFFORTS

Question 115: *Has your country implemented any structural mitigation to reduce tsunami impact? Examples might be sea walls, tsunami evacuation shelters or other man-made high platforms, building codes for earthquake-resistant, flood-prone, or typhoon-resistant structures, or vertical evacuation guidance? If yes please describe.*

Answer: Yes, in the form of earthquake-resistant building and *pemukiman akrab bencana banjir* (flood-friendly residence).(elevated housing)

6K: NON-STRUCTURAL MITIGATION INCLUDING LAND USE

Question 116: *Has your country implemented any non-structural mitigation, such as land-use policies regarding the location and building of structures or public utilities in potentially hazardous coastal areas, vegetative sea barriers, or the retaining or rebuilding of key features of the natural landscape or ecosystem that can serve to buffer the effects of future national disasters? If yes, please describe.*

Answer: Yes, in the form of allocating some affected areas for mangrove and land-use maps for 15 provinces (for Banda Aceh town: land use plan has been made with focus on evacuation and new construction zoning)

6L: EVACUATION ISSUES

Question 117: *Have tsunami evacuation maps, evacuation routes, and evacuation signage been developed for any part of your country?*

Answer: yes, for Padang. For Banda Aceh also, in a less developed way. NGOs and private sector stakeholders are providing guidance. However coordination with local government authorities needs to be increased..

Question 118: *If yes, please indicate where and how they were assembled.*

Answer: see 117

Question 119: *If no, does your country plan to do this in the future*

Answer: n/a

Question 120: *Is training required to build this capacity?*

Answer: Yes

6M: INTERNATIONAL COOPERATION FOR AWARENESS

Question 121: *Are there international agencies, or through bi-lateral or other assistance, any countries, universities, or other technical institutions that are you coordinating, cooperating with, or who are assisting in the development of materials or the deployment of information to the relevant institutions and/or the public?*

Answer: Yes

Question 122: *If yes, please indicate who and describe the assistance.*

Answer: United Nations (UNESCO, UNDP, OCHA, UNICEF), Red Cross, JICA and DIPECHO provide funding for disaster-related research activities

6N: INTERNATIONAL COOPERATION FOR STRUCTURAL AND NON-STRUCTURAL MITIGATION

Question 123: *Are there international agencies, or through bi-lateral or other assistance, any countries, universities or other technical or humanitarian assistance institutions that are you*

coordinating, working with, or who are providing services to strengthen your structural and non-structural tsunami mitigation activities at the local levels?

Answer: Yes

Question 124: *If yes, please indicate who and describe the assistance.*

Answer: World Bank, ADB and JICA among others provide assistance for rebuilding tsunami destroyed infrastructure with seismic and tsunami safety standards.

SECTION 7: TSUNAMI RESPONSE TO 28 MARCH 2005 M8.5 EARTHQUAKE OFF SUMATRA, INDONESIA

Scope: Please describe your country's response to this earthquake which did not generate a destructive basin-wide tsunami.

7A: PREPAREDNESS

Question 125: *Was your country more aware and your public better prepared to respond appropriately? Please describe how you ascertained this.*

Answer: When earthquakes were felt by people in the coastal region, the community prepared themselves to evacuate to higher ground. It reflects that a higher awareness and preparedness have been developed in the community.

Question 126: *Did they respond appropriately?*

Answer: YES (people ran to higher ground without instruction from authorities, upon feeling the shaking; SMS messaging and cell phone were efficient means for communication from the source area to the rest of the country, including BMG). Also radio stations quickly reported the earthquake (after having received phone call from the source area).

7B: ADVISORY

Question 127: *Did your country receive an internationally tsunami advisory message from the PTWC or JMA?*

Answer: Yes

Question 128: *How timely was this?*

Answer: less than 20 min.

7C: MONITORING SYSTEMS

Question 129: *Did your country have national monitoring systems in place that detected and evaluated the earthquake?*

Answer: Yes

Question 130: *How timely was this?*

Answer: more than 30 minutes (due to the need to manually process and locate the earthquake)

7D: NATIONAL RESPONSE PLAN

Question 131: *Did your country have a national tsunami response plan in place, and was it exercised?*

Answer: No, No. However BMG called BAKORNAS and sent faxes to various Government Agencies and media.

Question 132: *How did it perform?*

Answer: n/a

Question 133: *What went well and what are areas still needing coordination and improvement?*

Answer: n/a

SECTION 8: OVERALL ENHANCEMENT OF YOUR NATIONAL CAPABILITIES TO MITIGATE THE IMPACT OF HAZARDS (WMO)

Question 134: *Is your country addressing the establishment of the Tsunami Early Warning capabilities including response within your national boundary, with a multi-hazard framework? If (yes) please explain.*

Answer: Not fully. BMG will take responsibility for earthquakes, climate, extreme weather and tsunamis; Ministry of Public Works for Floods; Ministry of Energy and Mineral Resources for Landslides and Volcanic Eruptions; Ministry of Forestry for Forest Fires.

Question 135: *In the absence of a tsunami, how can you benefit from with the capacities and linkages being developed in your country, to better respond to other hazards?(e.g. improved dissemination, coordination and response to all hazards affecting your country)*

Answer: It should be admitted that tsunami has made great changes in the way we should manage the disaster. The lesson learned from the disaster has improved dissemination of information and has increased the awareness and preparedness of all components in the country for disaster. Before the tsunami, such knowledge was there and tsunami underlined the importance of disaster management understanding.

The massive loss of life and property has given strong impetus to natural disaster management and has caused a re-evaluation of existing response mechanisms as well as promoted the development of additional mechanisms for all hazards.

Question 136: *We would especially appreciate if you could comment further on critical areas where the international community can provide additional specialized technical or capacity building assistance.*

- Riset tentang capacity building, lihat presentasi pak Hamzah / pak nanang
- Capacity building
- Warning dissemination